LABOR-HEALTH, EDUCATION, AND WELFARE APPROPRIATIONS FOR 1961

HEARINGS

BEFORE THE

SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS UNITED STATES SENATE

EIGHTY-SIXTH CONGRESS

SECOND SESSION

ON

H.R. 11390

MAKING APPROPRIATIONS FOR THE DEPARTMENTS OF LABOR AND HEALTH, EDUCATION, AND WELFARE, AND RELATED AGENCIES, FOR THE FISCAL YEAR ENDING JUNE 30, 1961, AND FOR OTHER PURPOSES

TESTIMONY OF COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

PART 2

(of two parts)

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THURSDAY, MAY 19, THROUGH FRIDAY, MAY 20, 1960

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UNITED STATES OF AMERICA

LABOR—HEALTH, EDUCATION, AND WELFARE APPROPRIATIONS FOR 1961

THURSDAY, MAY 19, 1960

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to recess, in room 1318, New Senate Office Building, Hon. Lister Hill (chairman of the subcommittee) presiding.

Present: Senators Hill, Hayden, Russell, Stennis, Bible, Byrd, Kuchel, and Smith.

COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

STATEMENTS OF BOISFEUILLET JONES, CHAIRMAN, VICE PRESIDENT AND ADMINISTRATOR OF HEALTH SERVICES, EMORY UNIVERSITY, ATLANTA, GA.; ALFRED BLALOCK, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, JOHNS HOPKINS UNIVERSITY MEDICAL SCHOOL, BALTIMORE, MD.; VIRGINIA G. S. BURNHAM, VICE PRESIDENT, CONNECTICUT MANUFACTURING CO., INC., GREENWICH, CONN.; MICHAEL E. DeBAKEY, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, BAYLOR UNIVERSITY COLLEGE OF MEDICINE, HOUSTON, TEX.; EDWARD DEMPSEY, PH. D., DEAN, WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.; SIDNEY FARBER, M.D., PROFESSOR OF PATHOLOGY, HARVARD MEDICAL SCHOOL, AT THE CHILDREN'S HOSPITAL, DIRECTOR OF RESEARCH, CHILDREN'S CANCER RESEARCH FOUNDATION, BOSTON, MASS.; HARRY LYONS, D.D.S., DEAN, SCHOOL OF DENTISTRY, MEDICAL COLLEGE OF VIRGINIA, RICHMOND, VA.; LEO RIGLER, M.D., VISITING PROFESSOR OF RADIOLOGY, UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL AT LOS ANGELES, EXECUTIVE DIRECTOR, CEDARS OF LEBANON HOSPITAL, LOS ANGELES, CALIF.; BRIG. GEN. DAVID SARNOFF (USAR), CHAIRMAN OF THE BOARD, RADIO CORP. OF AMERICA, NEW YORK, N.Y.; CORNELIUS H. TRAEGER, M.D., PROFESSOR OF CLINICAL MEDICINE, CORNELL UNIVERSITY MEDICAL SCHOOL, NEW YORK, N.Y.; J. WALTER WILSON, PH. D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF BIOLOGY, BROWN UNIVERSITY, PROVIDENCE, R.I.; CECIL WITTSON, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF NEUROLOGY AND PSYCHIATRY, UNIVERSITY OF NEBRASKA SCHOOL OF MEDICINE, OMAHA, NEBR.; MARGARET H. SLOAN, M.D., STAFF DIRECTOR; MRS. BERNICE H. STORRER, STAFF ASSISTANT; AND MRS. CECIL M. WOOTTON, EXECUTIVE SECRETARY

GENERAL STATEMENT

Senator HILL. The subcommittee will kindly come to order.

We are very happy to have with us this morning the Committee of Consultants on Medical Research, which was set up by resolution of the Senate Committee on Appropriations, to determine whether or not the funds that Congress has been appropriating for medical research have been sufficient, whether or not the funds that have been appropriated in the past have been wisely and efficiently expended, and to make determinations with reference to the problems and the needs of medical research.

I may say, gentlemen of the committee, that this Committee of Consultants has devoted many hours of time and many days to making a study and investigation and in making their findings and bringing us their report with their recommendations.

They have made many personal sacrifices. Weekend after weekend they have traveled literally thousands of miles, leaving their families and their loved ones, to come to this work.

They have many responsibilities, many duties, many obligations at home, and yet they have been willing, as a service to this committee and to the public, to leave these responsibilities and to come here to render this service.

There has been no compensation for anyone. It has all been, I think we might say, a "labor of love," and for the good cause of medical research, for the health of our people, and for humanity; and, certainly, gentlemen, we welcome you, we appreciate your presence here this morning.

Mr. Jones is chairman of the committee, and we will be very happy to have you make any statement you see fit.

Mr. JONES. Thank you, Senator Hill.

INTRODUCTION OF MEDICAL COMMITTEE MEMBERS

First, I should like to introduce to the Senate subcommittee the members of the Committee of Consultants on Medical Research. I think many of them are already known to the members of your subcommittee, but I do think it would be well at this time to introduce them.

At the far right is Dr. Harry Lyons, dean of the school of dentistry at the Medical College of Virginia.

Next to him is Dr. Leo Rigler, a well-known radiologist, who is executive director of the Cedars of Lebanon Hospital, in Los Angeles, Calif. He is also visiting professor of radiology at the University of California Medical School at Los Angeles.

Dr. Edward Dempsey, dean of the School of Medicine of Washington University in St. Louis, Mo.

Gen. David Sarnoff, the chairman of the board of the Radio Corp. of America, New York City.

Dr. Cornelius Traeger, professor of clinical medicine at Cornell University, New York City.

On my left is Dr. Sidney Farber, of the Children's Cancer Research Foundation, and also at the Children's Hospital of Harvard Medical School as professor of pathology.

Dr. J. Walter Wilson, professor of biology and chairman of the department at Brown University.

Mrs. Virginia Burnham, an active worker in voluntary health agencies with a great deal of experience in this field, and head of an industrial corporation in Greenwich, Conn.

Dr. Michael De Bakey, professor and chairman of the department of surgery at Baylor University College of Medicine in Houston, Tex.

Dr. Alfred Blalock, professor and chairman of the department of surgery at Johns Hopkins University Medical School in Baltimore.

Dr. Cecil Wittson, professor and chairman of the department of neurology and psychiatry at the University of Nebraska School of Medicine in Omaha, Nebr.

I am Boisfeuillet Jones, vice president and administrator of health services at Emory University in Atlanta, Ga.

Senator HAYDEN. Mr. Chairman, all of them are wonderful.

Senator HILL. May I say that "praise from Caesar is praise indeed."

On my right here is Senator Hayden, the great distinguished Senator from Arizona. May I say that he was in Congress before most of us were born, because he has been in the Congress of the United States ever since Arizona came into the Union, and he has been a great and very wonderful public servant. As you gentlemen know, he is the chairman of the full Committee on Appropriations in the Senate.

Mr. JONES. Mr. Chairman, without the work of a very efficient and effective staff, our committee would have had great difficulty, and I should like to introduce at this time Dr. Margaret Sloan, staff director of our committee. She has been on leave from the National Academy of Sciences-National Research Council to perform this function.

I would also like to introduce her two staff assistants, Mrs. Bernice Storrer and Mrs. Cecil Wootton, who are seated in the rear.

This, gentlemen, is the group that you constituted to answer questions concerning Federal support of medical research in the United States.

COMMITTEE PROCEDURE

Senator HILL. Now, if you will, let us know just what your procedures were, how you arrived at your findings, and how you arrived at your recommendations, and give us that picture, will you, please.

Mr. JONES. Thank you, sir.

First, I will point out that this group of consultants was chosen by your subcommittee. Each member was chosen independently, although some had known each other previously under different connections.

The committee was first organized in September and held two preliminary meetings. Its actual proceedings got underway in October. From October 1 to February 1, this committee held 23 full days of hearings, to which were invited and at which appeared over 100 expert witnesses and resource personnel to advise with this committee on matters pertinent to its mission. These witnesses came from independent groups, professional associations, voluntary health organizations, philanthropic foundations, business, and governmental agencies. Every agency of the Government having major interest in medical research was represented.

The chairman and staff director of the Bayne-Jones committee and the Bane committee, authors of previous reports related to our interests, met with us.

The Secretary of Health, Education, and Welfare, the Surgeon General of the Public Health Service, the Director of the National Institutes of Health, the Directors of the various Institutes, and many of their colleagues gave us valuable testimony.

Representatives of the Office of Education, the National Science Foundation, the Atomic Energy Commission, the Veterans' Administration, the Department of Defense, and the three armed services, were likewise represented.

We heard from representatives of the National Academy of Sciences-National Research Council, the major foundations interested in medical research, and the voluntary health agencies.

We were also aided by testimony from representatives of the pharmaceutical industry, the life insurance industry, and by such professional organizations as the American Medical Association, the Association of American Medical Colleges, and the American Hospital Association. We had direct contact with the American Dental Association and the Association of American Dental Schools.

In addition to the Office of Education, we had contact with representatives of the university groups of the country, the American Council on Education, and the Association of Business Officers of the Colleges and Universities of the country.

This is a brief summary of the kinds of representatives that met with this committee for the purpose of discussing the problems before us.

I should like at this time to express on behalf of the committee our very real and sincere appreciation for the willing response of the representatives of all of these agencies to our requests for help and for information and material.

In addition to the testimony of these witnesses, we had available to us a very large volume of published and unpublished data pertaining to the whole program of medical research in this country. We have listed the greater part of this material in the bibliography.

We also had available information not heretofore gathered, which was secured by competent research people at our specific request.

After the hearings were completed additional meetings were held in February and March to discuss at great length the problems and questions on which the committee's judgment had been requested.

At no meeting involved in the hearing of witnesses did we have fewer than 9 of our 12 committee members present, and I should like to stress that this has been a full committee activity in which each member has played an essential role.

Senator HILL. May I interrupt you for 1 minute there, to comment on the fact that you have each and every member here this morning.

Mr. JONES. Yes, sir. All 12 committee members are present.

Senator HILL. And they come all the way from California in the West to Massachusetts in the Northeast; is that right?

Mr. JONES. Yes, sir. The Senator has referred to the fact that our meetings have been held primarily on weekends. The scheduled commitments of the members of this committee generally precluded meeting at times other than on Saturdays and Sundays, and these have been the days for most of our meetings.

I might add that this has made for domestic difficulties in some of our homes.

Senator HILL. You mean you had to get a leave of absence from your wife?

Mr. JONES. We had to get a leave of absence. I think the only thing that made it safe was to say, "We are working for the Senate." The job was a great deal more extensive and required much more time than we had anticipated.

Because of the great importance of medical research to the health of our Nation, the members of this committee accepted their assignment as a great challenge and an opportunity to make a worthwhile contribution toward the development of a sound and adequate program of medical research for the future.

Now, with these general introductory remarks as to our method of procedure, I should like now, with your permission, sir, to ask one member of our committee to speak on the subject of the role of medical research in our society. I should like to call on General Sarnoff.

Senator HILL. All right.

Before General Sarnoff begins, might I say that on the extreme right is Senator Byrd of West Virginia, then Senator Bible, of Nevada, Senator Stennis, of Mississippi, and, of course, Senator Hayden, of Arizona, and the chairman happens to come from Alabama, and Senator Kuchel from California, and Senator Russell from Georgia.

General Sarnoff, we shall be delighted to hear from you at this time. You may proceed in any way you see fit.

ROLE OF MEDICAL RESEARCH

General SARNOFF. Mr. Chairman and gentlemen of the committee, it is customary, I think, when one appears before a congressional committee, to first start out by qualifying himself. In this case I think the reverse is true. I ought to start out by disqualifying myself, as I am a lay member of a committee of distinguished scientists and professionals, who are at the very top in this country—and, in fact, throughout the world—in their respective fields.

However, I shall not take your time to discuss my disqualification. I shall pass that responsibility to your chairman, Senator Hill, because it was his persuasive eloquence that drafted me for service on this committee in a field in which I had no previous experience.

Senator HILL. But, General, may I interrupt you? You have had tremendous experience in the field of scientific and technological research other than medical research; is that not true, sir?

INDUSTRY FOUNDED ON RESEARCH

General SARNOFF. Well, sir, I have been with an industry that is founded on research, scientific research, and in the physical area of the sciences. In fact, we make our living on the tiniest particles of nature in the world, electrons, for the electron is the smallest particle of nature, in fact, smaller than the atom. When you split the atom and go into the nucleus of the atom, you find a lot of electrons inside of that and all around it.

It is not, however, as remote from the life sciences as one might imagine because here, too, medical research and medical activities deal with very small things, the human cell. It is a mark of our times and a very significant reversal, I might say, of all history, that we are learning now that we are living in a world of the smallest, the tiniest possible things which, when we learn how to control them and

how to use them, will represent in themselves the greatest possible power in the universe, that is, the atom bomb or H-bomb. Without the atom and without the electrons controlling the release of atomic energy, we wouldn't have an atom bomb or an H-bomb.

That might be a good thing in one way, for we don't control the particles of nature. It is also perhaps worth observing that these small particles of nature are not the inventions of man. They are the discoveries of man. They are the building blocks of the universe.

DISCOVERY OF THE ATOM AND THE ELECTRON

Whenever the universe was created, whether it was 6 billion years ago or more or less, the atom and the electron were created at the same time. I cannot undertake to offer even a suggestion as to why the knowledge of the existence of the electron and the atom was kept from man, or at least why he was not inspired to discover them until, in the case of the atom, only about 150 years ago, and, in the case of the electron, only about 65 years ago; and yet they have been here as long as the universe has been here.

The discovery of these new particles of nature, or, rather, these new discoveries of old particles, has revolutionized practically all of our thinking in the field of the physical sciences. What is more important, it has opened up new avenues of research and development and application in the medical sciences as well.

MEDICAL RESEARCH AT THRESHOLD OF NEW KNOWLEDGE

It is important to recognize that medical research is now at the threshold of new knowledge, and it is a characteristic of new knowledge that every time you make an inch of progress in the discovery of new information you make miles of progress in the possibilities of applying that new knowledge. It is not practical for anyone to measure research with a specific yardstick and say, "This is what you can accomplish within a specific period of time" or "This is what you must do" or "This is the course you must follow," because often the great discoveries and the great developments in science come from collateral fields. You look for one thing and you may not find it, but while you are looking, you discover something else.

That is the history not only in the physical sciences but also in the medical sciences and in the life sciences.

Now it was from that background of more than half a century of association with research in the physical sciences that I approached my task as one member of this committee, recognizing that, insofar as the specific details of medical affairs are concerned, I knew little or nothing. I want to say at the outset, Mr. Chairman, that I have been a member, as you know, of a number of committees in the past, Government committees and other committees, and still am, and I can say without the slightest hesitation that I have never been a member of any committee, either Government or private, where I saw greater dedication to the mission of their committee, greater application to the innumerable details that had to be mobilized and translated in order to make sense in a very scattered and sprawling field.

Not only were the men dedicated but they were informed, and I regarded it a great privilege, despite any time or effort it may have

taken, to have been permitted to serve on this committee, even as a lay member.

COMMITTEE REPORT

I also want to say, if I may, that the report which has been submitted to you this morning, in my judgment, constitutes one of the ablest reports that I have ever seen emerge from any committee. I can say that without taking any unction to myself, for I didn't write the report, but of course I was able to see its development and the various drafts, and as one member of the committee I would like to say to you, Mr. Chairman, that I am proud to attach my name to this report. I think it will go down in history as a real textbook on the subject, and I think also, if I may say so, that your committee, the Senate committee, in undertaking to explore and ventilate and to understand this highly important subject, has assigned to itself a historic mission. I believe that your work in that regard is as significant as any work that has followed the development of atomic energy, both for military and peaceful uses.

ATOMIC ENERGY RESEARCH

Now one of the reasons that atomic energy made such progress, especially in the military field, is that behind it there was a conception, there was a purpose, there was a goal, and there was a plan. It was not haphazard. And, in all the developments of science since man has been on this earth, nothing, I think, compares to the progress that has been made in the application of the knowledge of atomics and electronics, once the discoveries were made. Their application followed in a much shorter period than history records with respect to any other force that had been discovered and developed.

So it is that I plead with your committee and with all others who have an interest in this subject that the most important thing here is to formulate the right attitude, the right policy, with respect to this very vital subject, because no one, however expert or inexpert he may be, is in a position to measure this with a precise yardstick, so as to be able to say that it is worth this much but not that much, that we can afford this but we can't afford that, because when you are dealing with dread diseases, affecting the human lives of our population, I think no one is in a position to affix a dollar sign.

As a layman, when I hear discussions about these matters and questions such as "Can we afford to spend that much or can we not?" I try to bring it down in my own mind to the individual. Now, I am a businessman and I certainly have no predilection for spending money unnecessarily, whether it be on research or on anything else, and I have no affinity for inflation: I recognize its dangers and its perils. But, suppose, unhappily, a doctor should find that I had cancer, and he gave me that sad news, and he said, "In order to do what we can to make available to you whatever resources science and knowledge can provide, you will have to go into debt, you will have to spend what you have"—gentlemen, what would be the answer? Would I be worrying about inflation? Would I be worrying about going into debt if I thought there was the slightest chance of solving that individual problem?

Now that, I realize, is a purely personal and individual reaction, but after all the Nation consists of individuals; all of them that would be so afflicted would have that reaction.

HEALTH DEFENSE

Therefore, when we consider such important protections to our Nation as military defense and civil defense, I think we ought to add a third dimension, health defense.

If you do not defend your health, if you do not have a healthy Nation, a healthy population, all the military security and all the dugouts and hideouts and fallouts will be of no consequence.

Now, I do not propose to take the time of your committee to speak about things that are better said in this report, but I do want to highlight a few sentences and a few pages and urge you, busy as I know you are, to please read this report, because it tells the story better than any of us, I think, can tell it on the spur of the moment.

In connection with the general philosophy of research and science that I have discussed, I think that the report sums it up very well in a sentence or two—and this is on page xiii of the summary:

> The great advances already forthcoming from this program justify the expectation that, through medical research, the span of useful, enjoyable life can be still further lengthened, and that the benefit to society of longer, healthier, and more productive lives will be far greater than the cost of the research required to reach that goal.

ANNUAL COST OF DISEASE AND DISABILITY

And on the same page, skipping one paragraph, it says:

> The present cost of disease and disability to our Nation is estimated as at least $35 billion a year. Only through medical research and the application of its findings can these losses be reduced.
>
> The people of the United States have demonstrated through their Congress and through their private voluntary contributions that they consider it essential and urgent to support a determined attack on the dread diseases. Such an attack will require the full mobilization of the Nation's potential for medical research. This can only be achieved with substantial financial support, a major part of it from the Federal Government.

On the succeeding page, page xiv, it says:

> The funds provided by the Federal Government in support of medical research over the past 15 years have been substantial. Although generously increased in recent years, they have not kept pace with new opportunities in research which have developed, largely as a result of the very advances which the funds expended in the past have generated. They are still not sufficient to assure the full utilization of the Nation's present potential for an attack on dread diseases, and the current level of support is far from adequate to permit the great advances essential for the future.

EFFICIENT USE OF FUNDS

Now, as a businessman, my approach was to find the answers to the specific question, Mr. Chairman, that you asked when you assigned the mission to the committee of consultants, "Was efficient use made of the funds provided?"

Well, I subscribe wholeheartedly to the conclusion of this committee as stated in this report, a conclusion based on exhaustive study, exhaustive examination, testimony from expert witnesses, and so on, not an off-the-cuff conclusion, and that conclusion is as follows:

> Considering the Federal research program as a whole, the funds appropriated by the Congress for the support of research on major disease problems have been expended by Federal agencies with remarkable efficiency.

Now I will discuss the philosophy of our undertaking and our approach:

I might say that we came to the problem which all of those who deal with research ultimately reach: "How much is enough?" And how can you predict the future over the next 5 or 10 years?

We came to the conclusion that, while we can make an estimate that we can support, based on our studies, for the year immediately ahead, the march of progress is so swift in the sciences, changes and alterations and new conceptions come with such rapidity, that it is pure guesswork to sit down now and speculate what we are going to do 5 or 10 years from now in a particular field of research. I may say that that applies not only to medical research, but with equal force to research in the physical sciences. I would not be able to do it in my own company, and I would not accept the estimate of anybody who did it for me except as an educated guess.

This report does provide detailed recommendations of the amounts we think are actually needed for the various items in the list of appropriations requested, but these are limited to the immediate year ahead with the suggestion that the matter be reviewed from year to year in the light of new developments.

Now there are just two or three highlights in this report that I would like to call to your attention without elaborating upon them.

ADEQUATE SUPPORT FOR RESEARCH

On page xxiii of the summary, there appears this statement:

> Thus the committee concludes that if adequate support is provided, the great advances in the medical sciences which this country has witnessed in the past 60 years, remarkable though they are, will prove to be only the prologue to the great human drama which will be played in the battle against disease and disability during the decades immediately ahead.

Now how can one really justify any amount or any figure with which you gentlemen have to deal? The committee has summarized it, I think, extraordinarily well, in one sentence, and you will find that sentence on page xxv in the introduction, the second paragraph:

> The health of the people is the greatest resource of the Nation, absolutely vital to its welfare, economy, and security.

You may be interested to know that as sage a statesman as Benjamin Disraeli said the following on this same subject, even when knowledge and tools were limited compared to their existence today:

> The health of the people is really the foundation upon which all their happiness and all their powers as a state depend.

NEW APPROACHES TO PROBLEMS OF DISEASE

Again, you will find on page 2 of the report itself, this statement, and this is at the bottom of the page, the last paragraph:

> Such major extensions of our basic knowledge, the development of new tools and techniques, and the availability of trained scientists to use them, are enabling us to make new approaches to the problems of disease. Through continued research, and at a rate which in large measure will be determined by the amount of support provided, we shall make progress toward the prevention, alleviation, and cure of many of the disease conditions of greatest concern to mankind.

RESEARCH THE FOUNDATION OF PROGRESS

Now, in conclusion, Mr. Chairman, as a layman, approaching this from the standpoint of a businessman, I would say to you again in all earnestness that any large industry which looks upon research as a nuisance or merely as an overhead or only as an expense, is on the way out, particularly in this technological age, because research is the foundation of progress. Therefore, when we come to the greatest national asset that we possess, the human being, the health of our population, it isn't practical in my judgment to look merely on the liability side of the balance sheet and say "This is a cost" or "This is a liability". We must also look on the asset side of the balance sheet and estimate what it means to help find solutions to the problems that are still unsolved, particularly in the field of the dread diseases.

Whatever definition you may be given by experts or others as to what constitutes research—and you will hear much about basic research, applied research, and so on—as a layman I can only give you this definition in the field of medical research—particularly where dread diseases are concerned—"Research is the distance we must travel between the problem and the answer."

There is no solution to cancer until you have found the answer to cancer. There is no solution to heart disease until you have found the answer to it.

So, all of these intermediary steps, however useful they are—and they are useful—however important they are—and they are important—are secondary to the continued research, and the continued application of old knowledge and new knowledge, until we reach the end of that road where the answer lies to the problem at the beginning.

So, gentlemen, I thank you for the privilege afforded me to express my views this morning and suggest for all of us that we take the largest possible view of this vital problem, that we let our imagination stretch and our sights be lifted.

Senator HILL. Thank you very much.

Are there any questions?

POSSIBILITY OF ELIMINATION OF HEART DISEASE

Senator RUSSELL. I have just one question.

The general made a most impressive statement, but is there anything in the committee report to indicate when we will have an answer to all of this research? I am in favor of all of this research, but you don't have any expectations of eventually being able to eliminate, say, heart disease?

General SARNOFF. I would hesitate to express a professional opinion about that in the presence of eminent experts and world leaders who can answer that question better, but as regards the implication of your question, I may say to you that the report indicates the great progress that has been made and it also indicates the importance of continuing research. Certainly, there never should be an end to research, and I hope there never will be, because when we stop researching we stop living. There will only be an end to research when there is an end to life.

Senator RUSSELL. I think that is quite true, but I just wondered if there was any date that we would eventually solve all of these problems?

Of course, if you can cure 10 percent, I think all of it is worthwhile.

General SARNOFF. I think you will find the answers from the experts who will follow me, but if we do cure 10 percent then we have a much better opportunity to cure the remainder. As the base widens and new knowledge increases, further progress can be made.

Senator RUSSELL. I want to congratulate the general on the fine statement he made. I meet him in so many areas of our national life, he is an old friend to the Armed Services Committee, and now we find you very efficient in the field of medical research. You are certainly resourceful.

Senator HILL. You certainly speak with authority.

Dr. BLALOCK. Mr. Chairman, could I speak to Senator Russell's question?

Senator HILL. Certainly, but first let me express my deep appreciation to the general for his very impressive and most excellent statement.

Dr. Blalock, who is the head of the Department of Surgery at the Johns Hopkins University Medical School and who performed the first blue baby operation, and who has done many other magnificent operations, particularly on the heart, would you address yourself to Senator Russell's question?

Dr. BLALOCK. Mr. Chairman, my only claim to fame is being a classmate of Senator Russell's at the University of Georgia, and I have the same opinion of him, I might say, Senator Hill, that you expressed at a recent Senate hearing.

I have admired him for these many years since Senator Russell and I went to the University of Georgia.

HEART SURGERY

Now, I will speak mainly of surgery, because that is the field in which I have a particular interest.

At first, the only operations on the heart had to do with the suture of wounds of the heart and the drainage of infections. The first wound of the heart was sutured in the latter part of the last century.

The first wound of the heart to be sutured in this country was performed in Montgomery, Ala., in 1902, and the son of the gentleman who performed this operation is the chairman of your subcommittee.

Now, since that time in 1918 when Senator Russell and I were graduated from the University of Georgia, there have been tremendous strides, but most of them have occurred in the past 10 or 15 years. Up to that time there were operations only for the suture of wounds of the heart, and the drainage of infections and removal of scar tissue from around the heart. There had been no operations for congenital heart disease, no successful operations for valvular disease of the heart, and no excisions of aneurysms and replacements with grafts until that procedure was perfected by Dr. De Bakey.

I would not indicate, Senator Russell, that most of the accomplishments are complete. Much remains to be done, but real progress has been made, and particularly since funds have been supplied to investigators in this and other fields.

Now I would not maintain that heart disease will ever be totally eliminated. I suspect that some day all of us have to succumb to something, but I do believe that it will not be just an elimination of

10 percent; more probably it will be an elimination of 75 or 80 percent, so that I think, sir, there is reason for optimism.

Senator RUSSELL. Thank you very much, Doctor. Your statement is very much appreciated.

I am gratified by several things that have been discovered and I am well aware of the vital importance of our national health, and shall continue my efforts along that line. Let me say that since you made that statement, I am sure all of the members of the committee can understand why I am more proud of being your classmate than you are of being mine. [Laughter.]

Senator HILL. Well, I would say that the State of Georgia has every right to be mighty proud of both of you, a great doctor from Johns Hopkins and a great statesman from the State of Georgia.

Dr. Blalock, you spoke of Dr. De Bakey. Dr. De Bakey, is there anything you would like to add to this subject at this time?

Dr. DE BAKEY. I think Dr. Blalock has pointed out the nature of our progress and General Sarnoff has pointed out the difficulty of predicting what progress can be made. I think, however, that history provides a very good lesson in terms of what progress can be made in research following adequate support.

The progress that has been made in all fields of medical research within the past decade probably exceeds all previous progress of medical research prior to that time. One could almost chart the line of progress with the line of support.

Some diseases which were previously regarded as incurable, some of which Dr. Blalock referred to, diseases in which there was absolutely no means of effective treatment 10 years ago, are now absolutely curable in the sense that both anatomically and functionally the patients can be restored to normal.

I think we can look forward in the future to being able to achieve similar objectives in other disease conditions. The percentage of cures will be extremely difficult to estimate, but certainly this progress will not occur unless the research is intensified and supported adequately.

AMA DISTINGUISHED SERVICE MEDAL

Senator HILL. Doctor, is it not true that you are the recipient of the Distinguished Service Medal, of the American Medical Association, a medal which they give each year to the man who has done the most outstanding work in medicine for that year?

Dr. DE BAKEY. I must answer that in the affirmative. I would like to add, however, that Dr. Blalock preceded me in the reception of this award, which makes one even more proud of having received it.

DEVELOPMENTS IN TREATMENT OF "STROKES"

Senator HILL. I want to bring out the fact, as I understand it, that you were the recipient of that award because of the research that you did and the development that you brought forth, in relation to so-called "strokes." You showed, did you not, in many instances where we have a person who is paralyzed, and we had the idea through the centuries that this was an impairment of some blood vessel in the brain which it was impossible to reach, that many of these paralysis cases came about because of damage in blood vessels in the area of the neck

or maybe further down, even in the chest. You have been able to go in and take out that impaired blood vessel and put a plastic tube in place of it and relieve that paralyzed condition, is that correct?

Dr. DE BAKEY. That is correct.

I think we could turn to another point which better illustrates the advantages that come from research.

The very grafts that we are now able to use as substitutes for blood vessels constitute a direct product of research, and I think that this committee should feel pleased to know in this regard that it was through support by funds obtained from the National Heart Institute that vascular grafting has been developed through clinical institutions. There were many conditions in which there was absolutely no cure until this was made possible. This is a direct product of research and of the money spent for research.

ANEURYSMS OF THE AORTA

Senator HILL. You have demonstrated also, is it not true, that you not only can take out what we might call the normal blood vessel and put a plastic tube in place of it, but you can even take out the aorta, which is the largest blood vessel in the body, the blood vessel taking the blood from the heart, and put a plastic in as a substitute?

Dr. DE BAKEY. That is certainly true, Senator. Aneurysms of the aorta were a challenge to medical men for centuries and continued to cause disability and death without any progress as far as medical treatment was concerned, until approximately 10 years ago. Now aneurysms of the aorta can absolutely be cured. We have evidence of this now; patients survive these operations and they have now been living and leading a normal life for as long as 8 or 9 years after the operation.

Senator HILL. Just as you have made this remarkable progress in surgery on the heart, there has also been remarkable progress made in the treatment of heart conditions without surgery, is that not true?

Dr. DE BAKEY. Certainly there is great progress there.

Senator HILL. We have men in very high positions today who have had what we call a heart attack, a coronary, who have been able to carry on because of this new knowledge and this new treatment which previously we could not provide and which we have obtained through research, is that not so?

Dr. DE BAKEY. Absolutely.

Senator HILL. Do you have any questions, gentlemen?

Senator Smith, any questions?

Senator SMITH. No questions.

Senator HILL. There is no more devoted friend of medical research than Senator Smith.

Any other questions, gentlemen?

Senator BYRD. I have no questions, but I just wish to comment on the table that appears on page 24.

TOTAL MEDICAL RESEARCH EXPENDITURES

In that table I note that the total amount of money spent for medical research by the Federal Government, State governments, and private sources combined is estimated to total $715 million in the year 1960.

To me, Mr. Chairman, this is an infinitesimal amount when we consider the importance of medical research, and it seems incredible to me that the amount is so small. I had never thought of it before, but this morning it seems to me that $715 million in 1 year, coming from all sources, is a negligible amount, particularly when we remember that the American people spend $10 billion for alcoholic beverages each year. In other words, they spend $14 every year for alcoholic beverages for every single dollar that they are spending in medical research. I merely wanted to make that comment.

Senator HILL. Thank you, Senator.

Dr. TRAEGER. May I comment on Senator Byrd's comment, Mr. Chairman?

Senator HILL. Certainly.

Dr. TRAEGER. I think if you take to heart the short statement that Senator Byrd has just made we can all go home now.

Senator HILL. Thank you, Doctor.

Mr. Jones.

MISSION OF CONSULTANT GROUP

Mr. JONES. Mr. Chairman, as pointed out in your introductory remarks, the mission given to this group of consultants consisted of two major questions:

(1) Whether or not the funds appropriated for the support of medical research were sufficient, and (2) whether or not such funds were efficiently spent in support of the purposes for which they were appropriated.

You also directed that we take into account ancillary problems such as facilities, training, manpower considerations, and the like.

It is our purpose in these hearings to interpret our formal report, copies of which have been made available to you today.

In order to emphasize the answers to these two major questions, the committee has asked that I give to you, in a few minutes, a summary of this report, in terms of the concise questions asked.

TOTAL COST OF ILLNESS

Illness is costing this Nation each year $15 billion in private expenditures, $5 billion in Government expenditures, and $15 billion in disability losses. Apart from humanitarian considerations, medical research can reduce these economic losses. This has been demonstrated by a relatively small investment in medical research over the past 15 years and its extension of the life span of the average American. The result has been to add billions of dollars to the national income. The major chronic diseases—heart disease, cancer, mental illness, arthritis, and various neurological disabilities—are increasingly prevalent. Medical research is primarily directed against these major causes of death and disability.

Funds provided by the Federal Government over the past 15 years were not sufficient to meet the original needs and opportunities for medical research and research training, and, although generously increased, are less adequate today than ever. This is true largely because of the very advances which the funds have generated. Potentials in medical research exist today which were not even imagined in 1945.

In the Nation's medical research program as a whole, funds for research on problems of major diseases have been spent by responsible Federal agencies with remarkable efficiency. Wisely conceived administration of the research program has assured consistently high standards for the research supported, gained the confidence of the scientific community, and continued the traditional freedom of institutions and investigators.

EFFECTS ON MEDICAL TEACHING

Federal support for medical research has had important beneficial effects on medical teaching and on the practice of medicine. Facilities of the medical educational institutions have been materially improved and the quality of teaching markedly upgraded. In the practice of medicine, research has raised the standard of treatment and has provided new techniques and a degree of efficiency which have more than compensated for the limited diversion of physicians to research activities. The support of hospital construction through the Hill-Burton program has greatly increased the number of facilities within which the best modern medical care can be given.

The United States, with a rapidly expanding population and an increasing demand for medical service, faces a growing shortage of physicians and dentists. Steps must obviously be taken to correct this situation.

In its impact on other sources of support, Federal appropriations for medical research have stimulated rather than discouraged contributions from the States and from private sources.

Governmental agencies are making distinguished contributions to medical research, and the provision of adequate support for their programs is basic to a full national research effort. This applies particularly to the Public Health Service and its research arm, the National Institutes of Health. It also applies to the Department of Defense, Veterans' Administration, National Science Foundation, and the Atomic Energy Commission.

REQUIREMENT OF ADDITIONAL FUNDS

Development of the Nation's medical research potential will require substantial increases in Federal support each year. This support could well reach several billion dollars annually within 10 years. A leveling of support, and probably a reduction, can be anticipated as these programs are successful in the attack on disease.

For fiscal year 1961, the present programs of the National Institutes of Health could effectively use an increase of $176,500,000, and seven new areas justifying special emphasis would require $87,500,000. This is an increase of $264 million over the current appropriation of $400 and brings the total to $664 million. This is the measure of sufficient Federal support of medical research which can be efficiently spent in the year ahead if the Nation is to enlist its full potential in the fight against dread disease.

A new area of research emphasis offering unusual promise is the clinical research center for the comprehensive study of disease problems by teams of investigators, including support for the hospitalization costs of patients under study. Other new areas of emphasis are: primate and other animal facilities, libraries in relation to research, communications research and translation, instrumentation research, stable academic careers in research, and international medical research.

In addition, the separate current appropriation of $30 million for health research facilities construction would need to be increased by $20 million next year for adequate support; an urgently needed new program of health education facilities construction would require an initial $60 million; and the planning and construction of facilities needed at the National Institutes of Health would require $4,400,000.

Support of medical research short of the amount necessary to permit full use of the medical research potential of the country will delay solutions to problems of the dread diseases. The question is not whether the Nation can afford adequate support of medical research, but whether it can afford not to provide such support.

That then is a summation of the document which you have before you.

Senator HILL. Thank you, Mr. Jones.

Who is your next witness?

Mr. JONES. Mr. Chairman, we would like at this time to interpret, in somewhat more detail, major aspects of this report.

We have asked Dr. Edward Dempsey to speak to the question of the impact of the Federal program on the educational institutions.

Senator HILL. Dr. Dempsey, we will be delighted to have you proceed in your own way.

IMPACT OF FEDERAL SUPPORT OF RESEARCH ON MEDICAL SCHOOLS

Dr. DEMPSEY. Mr. Chairman, I wish to speak very briefly on the effect of the medical research programs of the Nation upon the medical institutions, and particularly the medical schools, from the point of view of answering some of the critical remarks which I have heard as to a possible deleterious effect. I wish to state my conviction that in actuality, the opposite is true.

It has been said, for example, that an excessive preoccupation with research carried on in our medical institutions actually works to the disservice of teaching in the medical schools, because of neglect by the professors and instructors of their teaching responsibilities in favor of the sometimes more exciting activities which go on in their research laboratories.

It has also been said that the great volume of research supported by the moneys which have been made available in increasing quantities in the last two decades has caused growing pains in the medical schools which in some instances have been so severe as to alter the character of the institution and actually to do a disservice to its teaching function.

I object to both of these statements because I believe they are reflections of a misconception of the true nature of a medical school.

Medical educational institutions have always suffered from a stereotyped image which is present in the minds of the public and which, in some instances, may be quite different from actuality.

For example, I think we all can remember the ideas prevalent 20 years ago that certain colleges were highly intellectual, while others were of a different type. These notions of the activities and functions within an institution may focus upon a trivial aspect of the organization rather than upon its main function.

FUNCTION OF MEDICAL SCHOOLS

In the case of medical schools, the stereotyped image is of an institution whose purpose is to teach undergraduate medical students a series of courses which lead to the degree of doctor of medicine, and that is all. In actuality, medical schools have as their proper function a great deal more than their undergraduate teaching. They are also responsible for the training of young doctors in the practice of medicine and in specialties, and in the application of the research findings which have been made in basic laboratories.

These activities in the graduate training of doctors actually exceed in time, in energy, and in money those necessary for the undergraduate program.

Medical schools are also vitally interested in, and participate in, the medical care of their respective communities. In many instances their communities are the Nation because our great medical centers do not have any local boundaries. Patients come to them from everywhere.

So, actually, the concept which is closer to the truth of a medical school is that it simultaneously engages in teaching of both undergraduates and graduates in medicine, it engages in research in the advancement of its field, and it engages in medical service to patients. There is usually very little distinction in emphasis among the three main areas.

In the past decade during which the Federal research program has expanded greatly, it has, in my opinion, vastly improved the quality of the medical schools. That has come about because the funds which have been made available have been used to expand the facilities of the medical schools, to make available research space previously unavailable, to equip our laboratories for the modern scene with instruments of great delicacy and frequently of great expense, and to provide the salaries for a larger number of people who carry out the research.

The medical school laboratories are used, not only for carrying out research, but also for research training of medical students, postgraduates, young M.D.'s and young fellows.

Now these are the school groups in which research training is brought about.

So in consequence of this extended activity and effort, the breadth and depth of a medical education have been greatly expanded. As a consequence of all of this, both the quality of a medical education and the quantity of young men who are today given adequate opportunity for developing their research careers have been greatly improved.

I shall not belabor this point any further except simply to emphasize again that the advantages to the medical schools in providing them a part of the means of accomplishing what they regard as their prime responsibilities have been enormous.

Thank you.

Senator HILL. Thank you, Doctor.

Any questions, gentlemen?

TRAINING MIDDLE-AGED AND OLDER DOCTORS

Senator RUSSELL. I have just one question.

These facilities do contribute a great deal to the training of our young doctors, but I had almost come to the conclusion that, if medical science is improving as rapidly as indicated, it might be worth training some of our middle-aged and older doctors as well as the young ones.

Dr. DEMPSEY. I think you are quite right. I am afraid I regard all of us as young doctors.

Senator RUSSELL. That is about as good an answer as any. You are a young doctor.

Senator HILL. Doctor, that includes Dr. Blalock, and therefore includes Senator Russell, his schoolmate.

Dr. DEMPSEY. Yes, sir.

Senator HILL. Thank you very much, Doctor, we certainly appreciate your statement.

Now, Mr. Jones, proceed.

Mr. JONES. Mr. Chairman, we have asked Dr. Blalock if he will speak to the question of medical manpower in relation to research generally.

Senator HILL. All right, Dr. Blalock.

EFFECT OF FEDERAL PROGRAM ON MEDICAL MANPOWER

Dr. BLALOCK. Dr. Dempsey is better able to speak to this question than I but, in order to give him some breathing time for a moment, I might say that Senator Russell has raised one of the most important questions that faces this committee. There is a very good statement about it on page 33 of this report. I will not take your time to read it, but will only mention several sentences which I think are of particular interest.

> During the last 3 years the number of college students applying to medical schools has dropped at a time when the number of college graduates has been increasing. Furthermore, the quality of applicants has decreased. These trends have occurred to a degree which constitutes a serious threat to the necessary increase in the number of physicians in the future.

Certainly we know that a larger number of physicians are needed now for practice, teaching, and research, and with the increase in our population there will be a real scarcity of physicians in the near future.

LENGTH AND COST OF MEDICAL TRAINING

There are many factors that have led to the loss of popularity of medicine as a career. The greatest of these, I think, are the great length and high cost of medical training.

At the present time, if a person is to obtain a really adequate training in the field in which Dr. DeBakey and I have a particular interest, it means that in most instances he has 4 years of college after graduation from high school, he has 4 years of medical school, and he has 5 or 6 years in training in a hospital after graduation, so there

we have about 13 or 14 years after graduation from high school. It is not only a long period of time, but a very costly affair, and the great majority of young people cannot afford it.

FEDERAL FELLOWSHIPS

The situation is worse in medicine than in any other field of science. In the middle of page 34 the statement is made:

> The Federal Government now provides fellowships for every field of higher education in the sciences except medicine.

There is rather good support for Ph. D. candidates, but very inadequate support for people who wish to train themselves in medicine. On page 36 there is the recommendation:

> The Federal Government should supplement private, industrial, and State sources in providing scholarship, fellowship and loan assistance to medical and dental students interested in careers of teaching and research, as it now does to Ph. D. candidates in the basic sciences.

Senator, I am sure that the second recommendation on that page is exceedingly important; namely:

> Greater effort should be made through the schools and the various media of communication to inform more young people of the opportunities for service and the challenge, satisfactions, and rewards of careers in medicine, dentistry, and public health.

As I said before, I think this is one of the most important problems for the health of the people of this country. The market is now a highly competitive one and we have to do something, not only to attract more young people into medicine, but better people into medicine. I know that I voice the opinions of the entire committee in that statement, Senator Russell.

Senator HILL. Any questions?

Senator RUSSELL. I was of the opinion that all of the facilities we had were completely filled, the facilities for training. Even if we had more applicants, Dr. Blalock, how would they train them?

DECLINE IN TOTAL APPLICANTS

Dr. BLALOCK. Well, sir, Dean Dempsey could correct me on this, but the number of applicants per place has declined to 1.8 as I recall it. Is that correct?

Dr. DEMPSEY. That is correct. Twelve years ago it was 3.5 per place. Today it is 1.8 per place for the entire United States. The number of places has increased by about 1,500 over a 15-year period and yet the total number of applicants, as shown in table 15 of our report, has decreased.

Senator RUSSELL. I thought we sponsored a bill to get the Federal Government to contribute a sum of money for the medical schools. We will do anything we can to assist the expansion of the medical colleges.

Dr. DEMPSEY. In the last 10 years there have been several new medical schools established, one in Mississippi, one at the University of California at Los Angeles, one at Seton Hall in New Jersey, and others.

There has also been an expansion in the freshman class in a number of the already existing medical schools. I cannot remember the figures

accurately at the moment, but my recollection is that there are about 1,500 more places available today than were available in the era before the war, in 1939 and 1940, so there has been a substantial increase.

Senator RUSSELL. Do you think a 1,500 increase is sufficient, or do you think we need still further increases?

Dr. DEMPSEY. No, it is certainly not sufficient. We have relied extensively upon the Bane report which points out rather dramatically that the increase that has occurred in the past is by no means adequate.

With the expanding population, the number of physicians which we are training has not kept pace with our needs by any means. Furthermore, in order to maintain the physician/population ratio we have today, we are importing a large number of foreign trainees into the United States, and are training doctors abroad. In spite of the relatively large number we are importing, there still is a deficit ahead of us.

BANE COMMITTEE RECOMMENDATIONS

The Bane Committee recommended that steps be taken to increase the total number of physicians which we can train by 3,600 per year by 1975.

Senator RUSSELL. Do you have any suggestions as to the methods whereby this problem can be solved?

Dr. DEMPSEY. We are recommending very forcefully that health educational facilities construction be undertaken by the Federal Government in addition to the health research facilities construction now in progress. In other words, that money be made available to expand the teaching space available for medicine.

AMERICAN MEDICAL ASSOCIATION POLICY

Senator RUSSELL. Is the American Medical Association (AMA) still opposed to direct Federal contributions to encourage an increase in the freshman class in medical colleges by 10 percent, or something of that nature?

Dr. DEMPSEY. I think their position has shifted considerably. I should like to refer this question to our chairman, but it was my impression that the official attitude of the AMA was one of approval of the Bane report, and expansion of educational facilities at the present time. They have become aware of the urgency of this problem to a degree that they had not been previously.

Senator RUSSELL. It takes time. I think that is true.

QUALITY OF MEDICAL SCHOOL APPLICANTS

Dr. Blalock, I notice you made a statement that the quality of medical school applicants was not as high as it had been. Is that due to any deterioriation in the premedical training in our institutions of learning, or is it due to the fact that the competition in other scientific areas draws off more of the bulk than it had before?

Dr. BLALOCK. I think it is the latter, Senator Russell. I think the preclinical or basic training is better than it was years ago. I don't think there is any doubt about that.

Senator RUSSELL. That is general all over the country?

Dr. BLALOCK. Yes, sir. But the competition is very keen, as you well know.

Senator RUSSELL. Do you have more competition from electronics and other such areas?

Dr. BLALOCK. General Sarnoff and others are taking a large part of the cream of the crop, and, furthermore, there is this matter of the high expense and the tremendous number of years required in getting the training.

Senator RUSSELL. Many years ago it took quite a bit to go to medical school.

Mr. JONES. It still does, Senator.

Senator STENNIS. If I may go back, I am glad to hear of a change of heart, as reflected by you gentlemen here, on the part of the American Medical Association.

One of the most discouraging experiences I have ever had was with respect to attempts to help very worthy young men in getting placed in medical schools. These were the most highly dedicated young men, the cream of the crop, the type of men which 10 years ago seemed to be in plentiful supply. Then I learned to my dissatisfaction that the berths in medical schools were just not available; there had been planning on too scant a scale by the medical profession. Through miscalculation, and various other things, there just were not enough openings.

STATE SCHOLARSHIPS FOR MEDICAL STUDENTS

I am thoroughly in sympathy with what you gentlemen have said. I think this is a problem which should have been tackled effectively long ago. In Mississippi we have had scholarships for medical students for more than 20 years. I think we were the first State to provide them through State appropriation.

Mr. RUSSELL. We do it with respect to the rural areas.

Mr. JONES. Mississippi likewise is one of the States that has provided for additional medical educational places.

Senator STENNIS. They converted a 2-year into a 4-year school.

Mr. JONES. Yes, sir.

Senator STENNIS. I am one of those that believes this is a matter of necessity, that you have to have this medical training. I appreciate what you gentlemen put down here in black and white as to what you found the picture to be. It is very vital at this time.

Mr. JONES. This was a very essential part of our concern.

Senator SMITH. Might I interrupt right there? It seems to me, Mr. Jones, this is all basic. How are we going to continue to increase these appropriations for medical research when we do not do something on the training program? I think that is even more vital than the research itself. We will soon be running out of people to do research.

Mr. JONES. You are quite right, Senator. We did consider this as a vital part of our concern and made a specific and urgent recommendation that the program as outlined in the report, "Physicians for a Growing America," which is referred to as the Bane report, be implemented as promptly as possible.

We have discussed this on page 13 in a few paragraphs based on an analysis by the Association of American Medical Colleges which gives an idea of the magnitude of the problem in relation to what has been done in the last decade.

I think, Senator Russell, this might be helpful in answering the questions you raise.

Senator RUSSELL. I was just reading it. I am very much impressed with what is stated. It would help very naturally to have the 2-year medical schools.

Mr. JONES. We are very appreciative of your comment, Senator Smith, and you are absolutely right.

Senator SMITH. I am quite concerned—and I am not sure it is for this committee to be concerned at the moment—but it would appear we are putting the cart before the horse, as they say, if we continue to try to do so much in medical research without the people to do it with. I think this ought to come before us, Mr. Chairman, and be given some attention.

BANE REPORT

Senator HILL. Mr. Jones, the Bane report came out at the end of October, did it not?

Mr. JONES. Yes, sir.

Senator HILL. In other words, it was available to you gentlemen and it outlined in detail the steps that should be taken to increase the enrollment in existing schools, for the establishment of new schools, and also for encouragement to get the most talented young men into the medical profession; is that true?

Mr. JONES. That is quite correct.

Senator HILL. In other words, your report, in a way, dovetails, in a sense, with the Bane report, which was released, as I recall, the 1st of November last?

Mr. JONES. That is right. We also have made some very specific recommendations to you, in line with the comment of Senator Smith that research is limited, at some point, by the availability of physicians.

Now this leads us directly to the next topic that we had proposed for discussion, and that is the question of manpower for research.

LOSS OF POPULARITY OF MEDICAL CAREER

Senator BIBLE. Might I ask this question, Mr. Chairman? I am not satisfied with the record at this stage. The report indicates that the number of college students applying for medical schools has dropped at the same time the number of college graduates has increased. Then you support these statistics, and you give as one of your conclusions as to the reasons for the loss of popularity of a medical career the fact that there has been a decrease in attractiveness of the image of the physician as viewed by high school and college students. I think this was effectively discussed by the members of this committee in previous years, and my experience has been exactly the same as theirs. It seems to me that the difficulty encountered by a college graduate in getting into a medical school is one of the real reasons why the medical career is less and less attractive. This word as to the great difficulty of getting into your medical schools gets back to the college student and discourages him from applying.

RATIO OF APPLICANTS TO OPENINGS

Now, I want to ask this question of Dr. Dempsey, because I do not know that I have asked any direct question yet, but did I understand you to say that today you have 1.8 applicants for every berth available? Is that what you said?

Dr. DEMPSEY. Yes.

Senator BIBLE. Well, does that not pinpoint your real problem, that your college students cannot get into medical school after they have devoted 4 years of premedical work? Maybe this is a little far afield, but I think this should be developed.

Mr. JONES. Senator, this 1.8 ratio of applicants to openings in the freshman class is relative to the situation 12 years ago when the ratio was 3.5 applicants, I believe—is that correct?

Dr. DEMPSEY. Yes.

Mr. JONES. A ratio of applicants per berth or place of 3.5 led to a selection process which in general assured a high quality of student being accepted for the places available, because the pool of applicants was large. Now the pool has dropped to the point where the selective process is not as conducive to quality of applicants as it had been, except as some have voluntarily eliminated themselves because of the competitive standpoint which you suggested.

Senator BIBLE. I think that is one of the factors. We have no medical school in the State of Nevada. We have many students who want to be doctors but cannot. They do not know the exact way.

SELECTIVE PROCEDURE

Maybe it is too much of a closed shop. I happen to be a lawyer, that is, my profession is law, and we have in our profession a pretty fair selective procedure, which, in my opinion, is too strict. It eliminates too many worthy men. Maybe you do the same thing in medicine.

I have an example of my own right now, a young man going to Europe to take his medical training because he cannot get into any of your schools here, and then he finds out when he comes back here you will not accept him because you do not think the foreign schools have the necessary curriculum and they do not have the necessary training. They do not have the 4 years of postdoctoral medicine, when in my day it used to be 1 year of internship and now it is increased to three, four, or five. I am just wondering, and this is not criticism of this distinguished panel, but it does seem to me that is one of the real sore points in training for doctors. You have made it so terribly, terribly difficult for them and they are being refused at almost any medical school they go to in the country.

I just thought that should be pointed out.

Mr. JONES. I think you have pointed out a factor with which this committee, in general, is in agreement, because we have urgently recommended implementation of the Bane report, which calls for a greatly increased capacity of our medical education system.

Senator BIBLE. I think some of the reasons that were given were rather confusing because, if you have made the medical profession less attractive to high school and college students, it is largely the fault of the medical schools themselves at this point.

Mr. JONES. Well, we are convinced that the time required for training and the expense of this training are very, very important deterrents to the interests of college graduates in medicine.

Senator BIBLE. I think that is one reason.

Mr. JONES. Yes, that is one reason.

Dr. Farber has a comment.

Dr. FARBER. May I say a word, Mr. Chairman, in reference to the very pertinent question which Senator Smith raised about the adequacy of the research personnel to use the research funds which are available.

MANPOWER FOR RESEARCH

I think the committee considered this in great detail and on page 38 stated its conclusion very definitely, as follows:

> The need for more physicians and dentists should not be considered a limitation of the continued expansion of the health research effort of the country at this time.

It should be emphasized that medical research is fortunately not limited to research by physicians and dentists. More than 50 percent of the research projects now in operation through the National Institutes of Health go to institutions which are not medical schools; to the universities and colleges, to research hospitals and private institutions which are not primarily medical schools. More than 50 percent of the research workers who receive grants now are Ph. D.'s and not M.D's. Therefore, while the committee recognized the tremendous importance of increasing the pool, not only of medical doctors, but also of Ph. D.'s and other kinds of scientists, we believe firmly at this time that the research effort can be expanded greatly with the research personnel and research pool presently available throughout the country.

There are many parts of the country that have not been exploited at all in reference to the conduct of research. Many institutions have members of the faculty and the hospital research staffs who are not working to anywhere near their full potential. To all of this vast pool of unused research personnel we can look for the next few years while we are trying to increase the pool by adding to the number of medical schools, by increasing the training of research personnel in universities and colleges through some of the very fine programs of the National Institutes of Health and the National Science Foundation, and while we are trying to increase as a whole the physical facilities for the conduct of research in many new parts of the country.

Senator SMITH. If I may, Mr. Chairman, at this point I want to thank you very much, Dr. Farber.

That is exactly what I had in mind, the training of research people as well as the doctors. I was concerned more with the shortage of medical technicians rather than with doctors. I do believe that, with these huge sums available for medical research, we must do something along the line of training programs for the research people themselves.

FUNDS FOR TRAINING OF RESEARCH PERSONNEL

Dr. FARBER. May I add, Senator Smith, that in this year the National Institutes of Health alone have about $88 million in training grants for the training of research personnel. This amount must be increased, however, because it has been recognized by your subcommittee in the past that the support of research training is one of the

most important functions that the subcommittee can exercise in deciding on the appropriations of the National Institutes of Health.

Senator SMITH. Thank you very much, Doctor.

FUNCTION OF BANE COMMITTEE

Senator HILL. Mr. Jones, for the sake of the record, I think we ought to make this very definitely positive: that the Bane Committee was set up by the Department of Health, Education, and Welfare to investigate and study and make recommendations and findings on this matter of medical education; is that not so?

Mr. JONES. Yes, Senator; "Physicians for a Growing America" is the actual title.

Senator HILL. Your Committee was set up in the basic field of medical research, primarily; is that not so?

Mr. JONES. That is correct.

Senator HILL. Your Committee, in its findings and in its recommendations, had before it the Bane Committee report and you really, in place after place in this report, support the findings of the Bane report; is that not true?

Mr. JONES. That is correct.

Senator HILL. It is a matter now, frankly, of the administration and Congress carrying out the recommendations for medical education, the recommendations of the Bane Committee, which it has before it.

Mr. JONES. Those aspects of that report which are particularly pertinent to medical research have been covered in this report.

Senator HILL. Those which are particularly pertinent to medical research have been covered in your report, yes.

You may proceed now.

Mr. JONES. I think, Mr. Chairman, that leads us directly into the next topic, which is the question of manpower for research, and this is to be covered by Dr. Wilson, whose personal experience has been primarily in a university. He does not work in a medical school.

Senator HILL. Doctor, before you begin I should like to put in the record at this point that you are professor and chairman of the department of biology at Brown University, Providence, R.I.

In other words, you are not connected with a medical school but you are the head of the department of biology there, is that not correct?

Dr. WILSON. That is right.

Mr. JONES. May I add one other thing for the record that seems exceedingly important?

Each member of this Committee who speaks to a particular point is speaking, not only for himself out of his own experience, but is speaking the unanimous conviction of this entire Committee. This is very important, in my opinion.

Senator HILL. In other words, they are speaking not only for themselves, but speaking for all the Committee members; they may speak from personal experiences outside, but also the unanimity of the opinion will be expressed by individual witnesses?

Mr. JONES. This is correct, sir.

Senator HILL. All right, Doctor, proceed.

MANPOWER FOR RESEARCH

Dr. WILSON. Senator Hill and members of the committee, on the Committee I have represented the nonmedical sciences in the sense that I represent the sciences that are health-related. They are the sciences that support medical research.

It has been suggested, however, that I might say something about my experience in the medical field.

I first began to work with the National Institutes of Health in 1948 when its program was just beginning to expand. I have acted in an advisory capacity on study sections, on the National Advisory Council on Health Research Facilities, and on other NIH committees ever since, so that I have been experienced in the conduct of that great program.

Now the question of manpower which has been allocated to me is not very different from the question of funds.

One major question to which the committee was asked to respond was "If funds are increased, is the manpower available to do the work we are paying for?"

EXPENDITURES FOR ALCOHOLIC BEVERAGES AND GREETING CARDS

I wish Senator Byrd were still here because I think he would be interested in the comment I am going to make. He mentioned the amount of money that was spent each year by the people of the United States on alcoholic beverages, and I saw recently the figure of $5 billion a year spent by the people of the United States on greeting cards. These are cards to send to the sick and the invalid, and so forth.

That is compared to the fact that we are spending only three-quarters of a billion dollars in research to prevent the sickness and invalidism for which the cards were sent.

The $5 billion for greeting cards is a waste. This is a cost. The greeting cards are thrown away. The money has gone down the drain.

Now, to take a word from General Sarnoff, the money that we are spending on medical research is not a cost at all. The money does not go down the drain. This is an investment, a big investment, from which we expect to get a return in large measure for a long time to come.

Senator HILL. May I interrupt you for 1 minute? I do not know what the figures are as of today, but I know that just a short time ago the American people were spending more money on tombstones than they were on medical research.

Dr. WILSON. I will accept that addition to my address, sir.

Now the question of manpower is somewhat the same. I think the experience in our country is that we have an inexhaustible supply of manpower to do any task which society really wants done. This is shown in the building of our highway system, in any military project that has been developed, and in the uses of atomic energy; we can get scientists and workers of all kinds in adequate numbers to do the job. It is equally true that manpower is available to do any amount of work we want done in the health sciences.

MEDICAL RESEARCH BY PH. D. PERSONNEL

Dr. Farber took a part of my speech away here a moment ago by pointing out that all of the health-related research is not done necessarily by doctors of medicine. In fact he gave some figures which I will simply repeat, that in the intramural research program of the National Institutes of Health itself, almost one half of the men there, including the men in the Clinical Center, are Ph. D.'s. and not M.D.'s.

An interesting point that I heard made recently is that in the preclinical departments of the medical schools themselves which give the major instruction during the first 2 years of medical school—excluding the subject of pathology—80 percent of the professors and staff members in these preclinical sciences are Ph. D's. and not M.D.'s. Therefore the Ph. D. man is an important factor in medical research

This is not only true in biology, which is my own area. The field of health research has come to depend also on chemists, physicists, and mathematicians, particularly those trained in statistics.

Senator Smith spoke of the importance of training. One of the points which was emphasized by almost every group of witnesses appearing before our committee was that one of the most important jobs of our society is to train more people in the area of research.

ADEQUACY OF AVAILABLE FUNDS

I do not think, Senator Smith, that we have neglected this. As was pointed out by Dr. Farber, the great program which your subcommittee has fostered has built buildings, supplied laboratories, and has supplied money for training as well as for research. However, this committee, as a whole, has become convinced, as it worked through its survey, that the money appropriated has not been enough, that more money could and should be used in training, in building facilities for research, and in supplying the wherewithal for research support.

I think there is one general statement which should be made in answer to the implication that if we put more people to work on health-related research, they might be drawn from other activities upon which society is equally dependent.

Now it is certainly true that society needs people in other activities and that there are only a certain number of competent, dedicated, and vigorous men who can take on the jobs that have to be done.

I will point out, however, that not all scientific research is done by geniuses, and that a large amount of important scientific research is done by lesser men.

In the department in which I work we have 20 men whom we would consider to be principal investigators. They are the scientists. For every one of them there are 5 or 6, or even as many as 10, other men who are contributing their share to the research program.

I have a janitor who prides himself on being involved in cancer research, and he is.

My whole program is almost as much dependent on the activity of that janitor and the responsible performance of his duties as it is on some of our more highly trained technical assistants.

So, in the conduct of research, we depend on many individuals in addition to the genius who has big ideas. They do not have many

big ideas, a genius may have one or two, but a genius who has very many is a most unusual person. We do have those rare men, fortunately. However, we also have many individuals who thoroughly understand what they are doing and intelligently follow a direct course to get results. Almost any really intelligent person could be trained to do that and our training programs are turning out a large number of well-trained men who are intelligent enough to do good research.

ANCILLARY PERSONNEL

The lone scientist working in a corner by himself has practically vanished. Today's research worker, even if he thinks he is alone, is actually dependent on all kinds of ancillary personnel, instrument makers, men who prepare his chemicals and who take care of his animals, clean his rat cages, and so forth, so this individual, this solitary scientist does not exist. He is dependent on a lot of others.

All of these things enter into the question of manpower.

Now I would only summarize again what I started out to say in the first place, that just as our society has funds to support anything that it wants to do, it has the manpower resources also to do the job.

Senator HILL. Do you have any questions, Senator Stennis?

Senator STENNIS. No, except to say it was a very fine statement.

Senator HILL. That was a very splendid statement, Doctor, and we certainly appreciate it.

Senator SMITH. Would it be well now to say thank you for giving the legislators credit for doing something along the lines of the medical research and training program?

The training program is nor quite as glamorous as some of them are, and it is one of the very difficult items to sell.

Dr. WILSON. Could I comment on that?

CHANGING MORES OF STUDENTS

I am sorry that Senator Bible is not here, but "glamour" is something that young people look toward and when Senator Bible raised the question "Why are our students not going to medical schools as much as they might?", I wanted to reply that there are many factors involved in that, but one which I think is basic is the changing mores of the students.

When I went to college, or when all of us went to college, I think no one thought of being married until he was graduated and could support a family. Now the number of our undergraduates who are married is surprising, and the wives are expected to work to support the husbands while they are going to school.

This is a good thing, I entirely approve of it, but this is one of the things that influences the choice of a career.

The single man can look ahead to glory in the distance and to money in the distance, but the man who is married and possibly has one or two children already, has to consider something else, and I think this is a more important factor than the difficulty that the young man would have in weathering an 8-year preparation for a career. This is only one of the important things, but one that makes the young man decide to go into other glamorous and highly paid professions with a more immediate financial return.

A good many of our young men who had previously gone to medical school are getting Ph. D. degrees now at the end of 3 years, rather than studying medicine for 8 or 9 years. These young men will be prepared to enter a career that is well paid and very attractive at the end of those 3 years.

Senator SMITH. Thank you, Doctor.

REQUIREMENT FOR MEDICAL DEGREE

Senator STENNIS. Is it possible to make the requirements for getting a medical degree a little lighter?

Dr. WILSON. I am an outsider on this, but I think that it probably will not be possible to lessen the time. The fact is that there are several experiments, as you probably know, being conducted on this.

From the point of view of a scientist who looks to the medical man as a scientist rather than simply as an artisan, you can train people, you could train midwives and you could train optometrists and a lot of other people of that kind quickly, and I wouldn't belittle that. If you want to train competent physicians, however, who, in addition to being artisans—which they all are—are competent scientists, who look at every patient as a research project which is a good thing to do, this is going to take time.

COMPLEXITY OF MEDICAL PROBLEMS

The complexity of the medical problems today, as compared to what was understood 10 years ago, has grown astoundingly. This is probably your fault, ladies and gentlemen, because you have put up the money which has raised the level of medical knowledge and the standard of medical practice to the present high point. If we are to maintain these gains, I believe we are not going to be able to reduce the amount of time required to study the vast subject of medicine.

I do think we are going to have to do something to bridge the financial gap imposed by the study of medicine, so that the wives and mothers of these boys, who have a great deal to do with the selection of their careers, will say: "If you want to be a doctor, go to it."

Senator HILL. It has been well brought out here today that, whereas there are various scholarship and fellowship opportunities for young men working for a Ph. D. in the basic sciences, there is almost no provision today for the young man who wants to work for an M.D. degree; is that right?

Dr. WILSON. That is correct.

Senator HILL. Any other questions, gentlemen?

If not, Doctor, we certainly want to thank you for your statement. We appreciate it deeply.

Now, Mr. Jones, proceed.

Mr. JONES. We have discussed the question of the impact of the large Federal program in support of medical research on the teaching institutions and the teaching program. We should now like to give some attention to the effect of this program on medical practice. We have asked Dr. Wittson to speak to this.

Senator HILL. All right, Doctor.

EFFECT OF FEDERAL PROGRAM ON MEDICAL PRACTICE

Dr. WITTSON. Mr. Chairman, part to the answer of this question has already been given by the remarks of others this morning. However, we did give considerable thought and consideration to this problem because it has been implied by some people that medical research has adversely affected medical practice.

It was our opinion that any concern that research has had an adverse effect on medical practice is unjustified.

On page xv of the summary we make a statement as to our opinion of the effect of research on medical practice, and I will read merely the first part of it:

> The expanding program of medical research has made tremendous contributions to medical practice in terms of new knowledge, techniques, and methods of treatment, and has been a prime factor in raising the standard of medical care to the highest level ever achieved.

CHANGE IN DISTRIBUTION OF PHYSICIANS

On page 22 of the report, table 10, it shows that while the number of physicians per 100,000 population has remained constant, there has been a change in the distribution of physicians. Fewer are in private practice, and more are in hospital service teaching, research, public health and Federal service.

As you will note, in 1949 there was a total of 201,277 physicians.

In 1959 it was 236,089. The number in private practice in 1949 was 150,417 and in 1959 160,592.

In 1949 there were 24,887 physicians in hospitals and that has grown to 39,730 in 1959.

The number in teaching and research in 1949 was 3,737 and that increased to 7,931 in 1959.

Those in Federal service, which includes those in the Armed Forces, and Veterans' Administration increased from 12,536 to 17,519.

However, there is no doubt that our population is receiving more efficient and effective medical care. As has already been pointed out, research has given physicians the ability to cure diseases which were incurable just a few years ago. Many of the infectious diseases have been completely eliminated. Discoveries in the science of nutrition have eliminated some conditions like pellagra, and so on.

MENTAL DISEASES

Some of the mental diseases for which we had no effective treatment just a few years ago, and for which years of hospitalization were required, can today be successfully treated and in some cases cured within a matter of a few weeks or a few months.

Even some forms of mental retardation, about which most of us were very pessimistic several years ago, can now be tremendously helped and, in some instances, successfully treated through the discoveries of the past few years.

INCREASED EFFICIENCY OF MODERN PHYSICIANS

Improvements in diagnosis, treatment techniques, and changes in medical service organizations has increased the efficiency of the individual physician, and enabled him to see more patients per day.

In 1930 the average physician was able to take care of approximately 50 patients a week. Today a physician can take care of about 100 in the same period.

Most physicians doing research are not in laboratories isolated from patients, but rather in active clinical situations. Good medical teaching in research requires good medical practice and good patient care. The teachers in research hospitals are making, and have been making, a large contribution to the medical care of the country.

For instance, the various psychiatric teaching research hospitals give care to more patients than the State hospitals with 15 to 20 times as many beds.

Just this week I visited a community general hospital, which is supporting a magnificent research and teaching program, and I asked the administrator and the chief of staff what effect this program had had on the patient care in the hospital and on the community which they serve They both stated it was their unqualified opinion that it had improved the quality and quantity of care given to the community, and that was why they were seeking to expand the teaching and research. As has been pointed out various professions other than medicine, such as biology, biochemistry, psychology, physics, and engineering and mathematics, which are now actually engaged in basic medical research are coming increasingly into clinical research. These allies are also giving increasing assistance to medical practice.

It is apparent that the doctor today is more efficient than the physician of a generation ago. He has available to him improved tools for diagnosis, better methods of treatment permitting him to handle more patients in shorter time, and with better results.

Thus medical research, as we have pointed out in the report, has added to the medical manpower, not by multiplying the number of physicians, but by increasing the effectiveness of the individual doctor, and of doctors as a whole.

Senator HILL. That was a splendid statement, Doctor.

Do you have any questions, Senator Bible?

Senator BIBLE. None at all, except to compliment the Doctor on his fine statement.

This matter covered the one thing that was constantly hit on the floor of the Senate when we tried to justify this increased money, that by research we are robbing the Nation of necessary medical care, and you have analyzed this beautifully.

Senator STENNIS. It is very encouraging that you could find such facts as that to present.

Senator HILL. Dr. Blalock, would you care to complement this statement?

Dr. BLALOCK. I cannot improve on it. He hit the bull's-eye and I will not alter his statement.

Senator HILL. You will just say "Amen" to his statement, Doctor?

Dr. BLALOCK Amen.

Whereupon, at 12:30 p.m., the committee recessed to reconvene at 2 p.m. of the same day.)

AFTERNOON SESSION—THURSDAY, MAY 19, 1960

Senator HILL. The committee will come to order.

Mr. Jones, are you ready to proceed, sir?

Mr. JONES. Yes, sir. It is immediately after lunch and we shall serve the dessert by having the lady member of our committee present the first statement of the afternoon.

Senator HILL. All right, Mrs. Burnham, we will be delighted to hear from you.

Mr. JONES. Mrs. Burnham has been quite active in voluntary health agencies and is particularly well qualified to speak to the subject of effect on non-Federal sources of support of the Federal program.

Senator HILL. You just proceed in your own way, Mrs. Burnham.

EFFECT OF FEDERAL PROGRAM ON NON-FEDERAL SOURCES OF SUPPORT

Mrs. BURNHAM. Senator Hill, Senator Stennis, Senator Hayden, this section of our report has to do with the impact of Federal support of medical research on non-Federal sources, the effect which the Government program of medical research has had on private giving.

I will commence by simply stating that this committee concludes as follows:

The expansion of the Federal program in support of medical research has served as a stimulus, rather than as a deterrent, to non-Federal sources of support.

I will now try to explain and document this statement.

As you well know, the role of the Federal Government in medical research is a relatively new one. Let us begin in 1940 when the first fairly significant sum of money was appropriated.

This sum was $3 million for medical research. That same year private sources donated $42 million.

Then came the war years and the program remained static so we will skip to 1947 and use this year as a basis for later comparison.

In essence, how very young, really, is this program? It is only 13 years old, almost like a teenager. I like to compare it to a teenager, to a child who has grown in fits and starts; its feet are too big and its arms may be too long, and it has a short body, but that is the way a child grows. So has this program grown, and it is now just entering the teen age. It has a way to go yet before it finally gains its full height and growth and becomes an adult.

NON-FEDERAL SOURCES OF SUPPORT

The four non-Federal sources of support are State governments, industry, philanthropy, and endowment. The total amount from these four sources is estimated in 1960 to be $335 million. This has increased from $60 million in 1947. In comparison, the Federal support in 1947 was $28 million and this year estimated at $380 million.

In considering these four sources of non-Federal support, I shall enlarge briefly on each one.

First, the State government's role in participating in medical research is very new. In fact, their participation is so new that the total has been evaluated accurately only in the past 3 years. But in those past 3 years, starting with $10 million, it has doubled in 1960 to

$20 million. We have every reason to believe that this increase will continue.

The second source of support, industry, plays a substantial role which has increased from $35 million in 1947 to $215 million in 1960, over sixfold. This increase contributes 30 percent of the total support.

Research is extremely vital to progress in most industrial efforts. Although such research is often applied research and a pharmaceutical industry orients itself toward research on drugs, a great deal of basic research is done by industry through contributions to institutions and medical schools, and also within its own walls.

I shall treat the third and fourth sources, philanthropy and endowment, as one because they are closely related. Probably the greatest speculation in regard to the effect of the expanding Federal program is concerned with private giving. Has this expansion served to slow down or dry up the collections of the voluntary health agencies such as the American Cancer Society, the American Heart Association and others? And has it caused a decrease in the contributions of the foundations to the health field and a decrease in the formation of new foundations for this benefit.

The committee has heard convincing testimony which is documented in this report, that the answer to these questions is a firm and definite "No."

It was stated unanimously and unequivocally by all those testifying that the Federal program of medical research is beneficial and stimulating to groups outside of Government.

TOTAL CONTRIBUTIONS BY PHILANTHROPY AND ENDOWMENT

Here are supporting facts to this statement. The total contributed in 1947 by philanthropy and endowment was $25 million. In 1960 it is estimated to be $100 million. Voluntary health agencies increased their contributions to medical research from $8 million in 1950 to almost $26 million in 1958. That is in only 8 years; and later figures, although they are still incomplete, continue to climb.

It is noted that some foundations have changed their field of emphasis within the life sciences, shifting to points of great and newfound need as other sources of support become available for the established areas. In this exemplary manner the private agency compliments the Government agency and the Government agency compliments the private agency.

Voluntary health agencies and foundations in their great flexibility and freedom of action can explore and evaluate the dimensions of need more readily than can a Government group. In such efforts private agencies can play a unique role and give leadership in new directions which the Federal Government may later follow.

Another example of Federal and private agency complementing one another is the manner in which the Government's construction programs in the health field, the Hill-Burton program and the health research facilities construction program are carried out with matching funds from private agencies. Such successful partnership of Government with private philanthropy and industry is highly commendable and can be expected to increase in the future.

One source of funds which has only partially been evaluated to date is the numerous small foundations which have been established

in the health field and especially in the last 10 years. Many people who have set up these foundations have done so because they or their families have benefited from the findings of medical research. The very fact that these foundations continue to be established is further evidence that the Federal program has not prevented private giving.

Up to this point my objective was to try to convince you, as this committee is convinced, that the progressive increase in appropriations by the Federal Government for medical research has been and is a stimulus to non-Federal sources of support.

I hope that I have been successful in this.

Senator HILL. Your statement has been most informative and most instructive and certainly makes very definite and clear that instead of Federal funds supplanting or in any way encouraging a depreciation of private funds, the very opposite has been true. That is, as we have increased Federal funds, so have the funds from the private organizations and private agencies, also increased.

Mrs. BURNHAM. Yes.

Senator HILL. We certainly appreciate this very informative statement.

Any questions, gentlemen?

If not——

Senator STENNIS. A very fine statement, indeed, for the record.

Senator HILL. Yes.

Senator STENNIS. It certainly fortifies the chairman and this committee in his position.

Senator HILL. That is one of the arguments they use against us: "If you give them Federal money they will not make the voluntary contributions." But your statement makes it very definite and clear that it is the other way around, that as the Federal funds are increased your voluntary gifts are increased.

Mrs. BURNHAM. Yes; that is correct.

Mr. Chairman, I have one more point if I may be allowed to bring it up, please.

Senator HILL. All right.

PARTNERSHIP OF PUBLIC AND PRIVATE FUNDS

Mrs. BURNHAM. I mentioned earlier about the Federal agency and the private agency complementing one another. This is an ideal situation and even though it is ideal, it exists today. In my mind's eye I have a picture of our great Government and our private resources as a cartoonist would draw them, Uncle Sam and John Q. Public hand in hand, joined together in a partnership dedicated to striking from the face of this world and from the lives of men and women the diseases that plague us all. This partnership of public and private funds has been established in some people's minds as a 50–50 partnership. True, this has been the case in the past few years. It has hovered around that ratio. But it is the considered opinion of your committee of consultants that the magnitude of Federal support of medical research should never be limited by, or paced by, the rate of increase of non-Federal sources.

The magnitude of support and the annual increment of support should be determined by one factor only and that is the need.

It is my deep and strong conviction, as it is of my colleagues on the committee, that with open minds and flexibility of judgment we

shall continue to advance until, one by one, heart disease, cancer, mental illness, neurological diseases, will all fall eventually beneath the weapons discovered and developed through medical research.

With your permission I shall quote from the Gospel according to Matthew.

If you have faith as a grain of mustard seed you will say to this mountain "Move hence to yonder place," and it will move and nothing shall be impossible unto you.

Thank you.

Senator HILL. That is a very fine statement, very fine.

I wonder if I might quote from Louis Pasteur. I think this is a particularly appropriate quotation at this hour in the history of the world.

SERVICE TO HUMANITY

Pasteur declared: I hold the unconquerable belief that science and peace will conquer over ignorance and war, that nations will come together to construct and not to destroy, and that the future belongs to those who accomplish most for humanity.

Certainly you here today are serving humanity. You are certainly making your contribution that we may accomplish for humanity.

Any questions? If not, we certainly want to thank you for this very fine statement, Mrs. Burnham.

Mr. JONES. Mr. Chairman, the major portion of our effort has been directed to a study of the research programs as carried out through the National Institutes of Health and related activities in the Public Health Service. However, we were mindful and concerned about programs of medical research which would be effective in the attack on dread disease as conducted through Federal agencies other than the Public Health Service.

We have asked Dr. De Bakey to speak to the topic of medical research in agencies of the Federal Government other than the Department of Health, Education, and Welfare.

Senator HILL. All right, Doctor. We are delighted to have you, sir.

GOVERNMENT AGENCIES OTHER THAN DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. DE BAKEY. Mr. Chairman, as Mr. Jones has indicated, there are other Government agencies which are concerned with medical research, mainly through their interest and their medical responsibilities in association with their respective missions.

I want to indicate all of these agencies, but I will say that the major ones, of course, are those of the Department of Defense, the Army, Navy, and Air Force and the Veterans' Administration. These agencies have in the past played a significant role in contributing to our knowledge in many fields of medicine. They have an unusual opportunity to carry out research activities in some areas, indeed in some instances a rather unique opportunity, because of the nature of the problems with which they are faced or because of the clinical population which is available to them.

This is particularly true in the Armed Forces and in the Veterans' Administration and, in a sense, these agencies can supplement each other in carrying out research activities, some of which cannot be undertaken as well in any other agency or in civilian life.

This has been well illustrated by a number of activities which they have already brought to fruition. These include such activities as research under the national blood program on the preservation and long-term storage of blood at very low temperatures, advanced work on sterile animal research, and the development of a tissue bank.

It includes certain followup studies which I think have been extraordinarily well done and could not be done by any other agency.

Because of the records that are available to the Armed Forces, the illnesses that occurred during the war, and the ability to follow up the patients through the Veterans' Administration certain well-developed programs of followup studies have been carried out and extended over a long period of time.

LONG-TERM STUDIES

Fundamental knowledge has been gained as a result of these studies through the ability to carry out long-term studies that would give the natural course of certain illnesses.

I could go on illustrating any number of activities of this kind which have contributed to furthering knowledge in many fields of activity.

But the important point I would like to make is that these research activities in other Government agencies can and have contributed significantly to the furtherance of medical knowledge and in that sense constitute a great potential for future research.

For this reason our committee was quite concerned with the level of support that has been available to these agencies for medical research. And for this reason it has made specific recommendations for expansion of this support.

LEVEL OF SUPPORT

In the report you will find documented in very simple fashion the level of support that has been available to these agencies over the last several years, and it will be noticed that this has remained almost at a stable level, rather than being increased.

In a sense this is a decrease in support because of the increasing cost of research with the general increase in the cost of all activities during this period of time.

Senator HILL. You either go forward or backward, do you not?

Dr. DE BAKEY. That is right.

It is generally agreed that approximately a 5-percent increase is necessary merely to stay at the same level of activity. So, relatively speaking, these agencies have had to cut back upon their research programs when they have a truly great opportunity for expanding their activities and adding to the medical research potential of this country and furthering our knowledge in many important areas.

For this reason we are very strongly recommending that the levels of support for medical research by these agencies be increased, not only to serve their specific missions in the health field, to support their special research institutes in regard to both personnel and facilities, to raise the quality and standards of practice within their hospitals, but also to provide increased opportunities for adding to our knowledge of serious disease.

ADDITIONAL SUPPORT REQUESTED

There are specific recommendations in more detail in the report, but these supplementary remarks may serve to highlight the nature of this problem and explain why we feel very strongly that these other agencies should also receive more adequate support.

Senator HILL. Doctor, we are certainly delighted to have this very enlightening statement from you.

I may say that this subcommittee does not handle all the appropriations that go to all the agencies but, as members of the subcommittee we are all members of the full committee, and the full committee has the final action, the final say, and we have our distinguished chairman of the full committee with us.

So we are delighted to have this very informative statement from you, sir. We appreciate it very much.

Mr. Jones.

RESEARCH IN HEW AND NIH

Mr. JONES. The next general subject has to do with research in the Department of Health, Education, and Welfare and some general considerations as to the research activities of the National Institutes of Health.

About 93 percent, roughly, of the research in the Public Health Service is conducted through the National Institutes of Health, and we therefore limited our discussions of the other 7 percent within the Public Health Service.

We are greatly interested and encouraged by the reorganization study now being brought to conclusion within the Public Health Service which will assure more effective management of the respective responsibilities of the Service. This committee has been especially pleased at evidences forthcoming from this study that the problems of environmental health, which are increasingly with us, will receive concentrated and effective attention in the structural reorganization of the Public Health Service.

We are also interested to learn and to approve the special emphasis which will apparently be accorded to the problems of aging.

APPLICATION OF RESEARCH FINDINGS

The third area of particular concern to this committee is the apparent intention of the Public Health Service to strengthen its activities related to the transmission of new knowledge into the active program of medical service to our population generally. We think it is highly important, and is a justification of the research which has been carried out. It must be given application if it is to be justified.

Senator HILL. We are living in a new world, are we not?

Mr. JONES. Yes, sir; a new world.

Senator HILL. We appreciate that.

REORGANIZATION PLANS

Mr. JONES. We are very much encouraged and pleased by the reorganization plans the Surgeon General has already announced.

Senator HILL. Good.

ASPECTS OF NIH PROGRAM

Mr. JONES. As to the National Institutes of Health, we shall speak generally to four aspects of the program.

We are deeply concerned about the problems of the National Institutes of Health in relation to personnel, particularly the top-level positions.

Without going into great detail, we strongly urge consideration of an increase in the number of the special top-level positions provided by legislation under section 208(g) of the Public Health Service Act, and an increase in the ceiling of remuneration for these positions. The National Institutes of Health are handicapped in filling their top-level positions, which are of such tremendous importance to the entire research community because they are falling behind comparable situations in educational institutions and, of course, in industry, where there is strong competition for the talents that are badly needed to administer properly the extensive research activities of the National Institutes of Health.

CONCERN FOR COMMISSIONED OFFICER PERSONNEL

We are also concerned that ways be found to make it possible for commissioned officers of the Public Health Service to be offered and to accept civil service positions without loss of benefits and with a recognition of additional responsibilities that they may receive or be given. This is necessary because there is a limitation of top-level positions within the commissioned corps in terms of organizational structure. Yet the jobs that must be filled, particularly at the National Institutes of Health, call for personnel of outstanding ability who can command salaries elsewhere at a higher level than is permitted within the organizational structure of the Public Health Service. We think that some modification of the system of interchange here would be highly advantageous to the proper administration of this extensive and most important program.

FURTHER RECRUITMENT DESIRABLE

We are also concerned in this same connection that the National Institutes of Health have more freedom to recruit top-level personnel from outside the Public Health Service as well as from within the commissioned corps.

Senator HILL. Do you not think that is very important?

Mr. JONES. We think it is of tremendous importance that the people administering and leading this great research program, which means so much to the people of our country, should be selected from the largest possible pool of outstanding individuals, and not be limited to members of the commissioned corps.

These three items tie in pretty well together in terms of the personnel problems of PHS.

Senator HILL. I doubt if many men who enter the commissioned corps as young men are thinking in terms of research. They are thinking more, perhaps, in terms of other duties and responsibilities of the Public Health Service, is not that true?

Mr. JONES. That is correct.

Senator HILL. They ought not to be limited just to the commissioned corps, is that right?

Mr. JONES. That is our unanimous opinion. However, we do not wish in any way to minimize the competence of the commissioned corps or the effectiveness of their efforts.

Senator HILL. I would certainly join with you in that appreciation of the corps.

SOURCE OF PERSONNEL SUPPLY

Mr. JONES. It is also pointed out in our report that the commissioned corps has to likewise supply the personnel for the Bureau of Medical Services, the Bureau of State Services, and the Office of the Surgeon General of the Public Health Service, in addition to the National Institutes of Health. There are just not enough outstanding members of this small corps to answer all these needs.

Another area of general concern has been that of the actual physical facilities for the National Institutes of Health at its Bethesda campus. There are several items of concern.

STAFF HOUSING PROBLEM

There is a large number of the NIH staff which cannot be housed on the campus but are located in rented space quite apart from their colleagues. This decreases the effectiveness of administration. We feel that additional office space beyond that now under construction should be made available at Bethesda.

There would be a great improvement in the programs for two of the Institutes if a special research building would be made available. This would be for the National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health for their own intramural research activities. These should be housed in a structure designed especially for their purposes.

Senator HILL. I think those two institutes have been housed in buildings which were not designed with any thought in mind of serving the special purposes of those institutes, is not that true?

Mr. JONES. That is correct; yes sir.

We also feel that there is full justification for a special physical biology building which would provide for the entire NIH intramural program a facility to utilize the new techniques of physical biology that are now so important to medical research.

A new idea which the committee has considered and feels highly justified, is the creation of an international conference center at Bethesda which would facilitate the exchange of information between scientists of different countries and give focus to the increasing responsibilities of the NIH in international medical affairs.

ANIMAL FARM DEVELOPMENT

There is need for funds to provide for development of the animal farm for NIH and there are miscellaneous physical improvements related to services in the various buildings and facilities of the campus.

These in general are the facilities that we think are needed at the campus in Bethesda.

Senator HILL. Mr. Jones, we are certainly glad to have this statement from you and from your Committee, because if the NIH is to function as we wish it to, efficiently, it must have adequate physical housing and facilities; is not that right?

Mr. JONES. That is correct.

Senator HILL. We certainly appreciate this very, very much.

Mr. JONES. This relates directly to the question that you asked of us, the efficiency with which the money is spent. We think these facilities will provide for greater efficiency in the administrative management of the program and in the research as carried out on the campus at Bethesda.

Senator HILL. You could get better returns on your expenditures, better dividends?

Mr. JONES. Yes, indeed.

There are some technical recommendations having to do with actual operations of the NIH program which I think can best be read in the report. I will mention them only briefly.

ADDITIONAL STUDY SECTIONS

We think that additional study sections should be organized as the program demands, provided we do not get beyond the point where the members of a study section in a particular field can retain a comprehensive view of research in progress in the particular subject for which they are responsible.

Obviously, there needs to be an increase in the administrative staff to service the growing program of medical research. There needs to be continuing attention, as there has been in the past, to new administrative patterns and techniques for support of research; such things as the research centers which will be discussed in more detail subsequently, institutional grants, program grants, and other techniques which make more effective the system of distribution of support for medical research.

There are other specific recommendations having to do with training grants and the like, but I shall not comment on those in detail at this time.

INTRAMURAL ACTIVITIES

The fourth general category of comment has to do with the intramural activities of the National Institutes of Health at Bethesda. These programs speak for themselves in terms of accomplishments and the respect with which the entire scientific community holds the activities at the Clinical Center.

Individual members of the Committee are familiar with the scientific competence of the intramural programs of the different institutes, and the Committee as a whole believes that these programs are quite effective and efficiently managed.

We are impressed with the fact that the intramural program at Bethesda has just about reached the optimum size of its development. The needs from this point on will relate primarily to improvements of quality of work done through better support of personnel, through instrumentation and equipment which is required to support their current activities, and for the special needs which I have previously mentioned. But there is full agreement within our Committee that the program has just about reached an optimum size for the institutes at Bethesda.

These are our general comments about the NIH program and its activities on the Bethesda campus.

Senator HILL. We want to thank you for the picture you have given us of the situation there, both as to personnel and as to facilities, because we realize how important these two matters are.

REIMBURSEMENT FOR FULL RESEARCH COST

Mr. JONES. Now we come to two specific items of considerable interest to the grantees of medical research. One of these has to do with the vexing problem of reimbursement for the full costs of medical research. We have asked Dr. Farber to speak to this topic.

Senator HILL. All right, Doctor.

COSTS OF RESEARCH

Dr. FARBER. Mr. Chairman and members of the subcommittee, if the trend established by the congressional committees concerned with appropriations for the National Institutes of He lth continues, and if the report of this Committee of Consultants is to be accepted by your subcommittee, Mr. Chairman, then it is very important to tackle at once those problems which may hold back research progress. In the opinion of the Committee, there is no problem which is more important and that poses a greater threat to the progress of research in medicine than the solution of the problem of so-called indirect costs or overhead.

MEANING OF "INDIRECT COSTS"

In the first place, "overhead" is an unfortunate term. It implies a profit on the part of an organization. The term "indirect costs" has very little meaning.

Your subcommittee has recommended in the past an increase from the 15 percent of direct costs at present allowable by the NIH for indirect costs to a figure of 25 percent. The National Science Foundation and the armed services research programs now allow 20 percent. So there is great variation within the Government itself. In addition, when the National Institutes of Health awards contracts, these contracts are paid for under the provision for total costs, which in the studies carried out for 1957 and 1958 in 80 medical schools averaged 25.1 percent.

MEDICAL SCHOOL FINANCING PROBLEM

The problem put simply is this: If a medical school or research institution is given the privilege of carrying out research on an expanded basis to the amount, let us say, of $1 million, that institution must find $100,000 of private money somewhere to pay that portion of the cost not borne by the research grant. The fact of the case is that the Committee has found from hearing witnesses and from its own knowledge and experience that administrators, presidents of universities and deans of medical schools will soon be forced to turn down the opportunity given them for the expansion of the medical research which all of us want to see carried out, unless the total costs of research can be furnished with the research grants.

The recommendations of the Committee concern the payment of what might be called actual costs. If we could drop the terms

"indirect cost" and "overhead" and substitute the much more descriptive term "actual costs," I think we would be nearer the truth.

FINAL RECOMMENDATIONS

On pages 15, 16, 17, and 18 of the report, this discussion is given with supporting tables. The opinions of the Committee are well documented, leading to the final recommendations which I would like to read:

Payment of Full Costs of Research.—The National Institutes of Health should be authorized to allow a realistic amount for the costs of research directly related to the program supported. This could be provided in either of the following ways, listed in order of preference:

1. Full costs as determined by a cost analysis formula (such as that proposed in the Bureau of the Budget Circular No. A–21), or
2. Twenty-five percent of total direct costs, except for those institutions which have formally established lower rates on the basis of audit by a Federal agency.

The average, I repeat, for 80 medical schools in 1957–58 was 25.1 percent.

I should just like to add a word for the Committee. These actual costs should be defined in terms of those costs brought into existence by the onset of the research program. We should not include reimbursement of an expense which goes on at an institution if there were no research or which is not increased by research. Heat, light, and maintenance, for example, would go on if there were no research. The cost of these services will be increased in measurable amount, however, by the added and specialized activity necessitated by a research program. The maintenance of grounds and salaries of fixed personnel, such as university presidents, deans, or research institute directors, would all go on if there were no added research programs and such items therefore should not be included in the formula.

"ACTUAL COST" DEFINITION

It is hoped that the definition of "actual costs" in fair and realistic terms, calculated within the frame of reference of the total cost of the research program in question, will act as a solution for a vexatious problem. This problem, if left unsolved, will stand as an obstruction to effective utilization of the magnificient opportunities afforded research workers throughout the country by the farsighted recommendations of the congressional appropriations committees.

Senator HILL. Doctor, Senator Hayden and Senator Smith well know we have had this matter before us for the past several years. We have had our difficulties in the conference committee with the House of Representatives and I am very much impressed with your presentation. I like the use of the words "the actual costs." In other words, you are suggesting that we meet what we might also term the additional cost; that is, the additional burden or cost that is imposed by the research; is not that true?

Dr. FARBER. That is right, sir.

Senator HILL. Some have sought to construe these words "indirect costs" to take in a whole lot of things which you have made very clear you do not recommend be included. You have made a most intelligent presentation of this matter that has been before this com-

mittee for some time and has presented a very difficult problem for us.

Dr. FARBER. Thank you.

Senator HILL. We certainly appreciate your highly intelligent presentation. I think anyone can read your statement and know now what we mean by this additional or, as you well express it, this actual cost.

Dr. FARBER. Thank you, sir.

Senator HILL. Mr. Jones?

PROPOSED LEGISLATION ON INSTITUTIONAL GRANTS

Mr. JONES. Thank you. Another area of special concern to the Committee which has been under discussion and is the subject of proposed legislation is the concept of institutional grants. We have asked Dr. Rigler to speak to this topic.

INSTITUTIONAL GRANTS

Dr. RIGLER. Mr. Chairman, you have already heard something of the impact of the Federal research grant program on medical schools and the great benefits which have been derived. At the same time, the project grant procedure, whereby individual investigators make application and receive funds for their own research, has tended to produce some distortion, some imbalance in the teaching and research programs of the medical schools and the research institutes.

Furthermore, the rather large increase of applications which all of us are very happy about, at the same time has put a very large burden on those members of the scientific community who have accepted the responsibility of reviewing these applications to be certain that the funds are fairly distributed and efficiently spent.

In an effort to achieve some redress of these two minor but very troublesome attributes of the project grant procedure, legislation has been proposed by the Secretary of Health, Education, and Welfare, at the suggestion of the Surgeon General and the administration of the National Institutes of Health, which would permit the allocation of a portion of the research grant funds directly to institutions in the form of institutional grants, the distribution of such funds to be in the hands of the local institutions.

We hope that this would tend to restore a little better balance to the programs of these institutions, and especially to permit them to give small grants to young and relatively unknown investigators on a trial basis. We could hope that from such sources new ideas and new research men will be obtained for the future.

Our Committee supports this legislation and the details of the reasons for its support and what we would propose are given on pages 19 and 20 of the formal report. We support it and hope it will be given favorable consideration.

CHANGES IN PRESENT LEGISLATION RECOMMENDED

Let me point out, however, that there are certain changes that we would recommend in the legislation as presently introduced. We would recommend that the Public Health Service be permitted by law to make institutional grants upon recommendation of the appro-

priate council of the National Institutes of Health to public or nonprofit universities, hospitals, laboratories, research institutes, medical schools, and other institutions for the general support of their medical research and research training programs.

We would also recommend that no specific limit be put on these grants, leaving it rather to the discretion of the administrators of the NIH to determine what proportion of the total research funds should be so allocated. We would all hope, of course, that the current highly effective project grant method would continue as a major method for the support of research.

Senator HILL. This will be in a sense supplementary to the research project grants, Doctor, is that right?

Dr. RIGLER. That is right. A certain percentage of the total funds for research grants would be applied in the form of institutional grants.

Senator HILL. Institutional grants, yes. I think we will have to enact legislation for that purpose, Doctor.

Dr. RIGLER. That is right.

Senator HILL. We are certainly very happy to have this very clear statement from you here today. We appreciate it very much, Doctor. In fact, I happen to be in a dual capacity as chairman of the legislative committee that handles this legislation, and I shall certainly take advantage of your testimony here today and bring it to the attention of the members of the legislative committee in relation to this legislation.

We appreciate very much your statement.

The next witness, Mr. Jones?

COMMUNICATIONS AND INSTRUMENTATION RESEARCH

Mr. JONES. The developments in the physical sciences have been alluded to as of great importance in the field of medical research. There are two areas which are of particular concern to this Committee in the future development of medical research. These have to do with communications research and instrumentation research. We have asked General Sarnoff to lead the discussion of these two topics.

Senator HILL. General, we shall be delighted to hear from you, sir.

COMMUNICATIONS RESEARCH AND INSTRUMENTATION RESEARCH

General SARNOFF. Mr. Chairman, perhaps I can save the committee time by referring to pages 94 and 95 of our Committee's report.

On page 94 there is a very clear statement, paragraph D, entitled "Communications Research":

> The general problem of scientific communication is one of the areas in which the National Institutes of Health has failed to exert leadership. The enormous problems of handling the rapidly increasing flow of new information in the literature, of codifying it and making it readily accessible urgently cry out for solution. It is now virtually impossible for any investigator to keep up with all the reports of interest and pertinence to his own work which are appearing in the literature, and many find themselves seriously handicapped, or engaged in unnecessary duplication because of this difficulty and publication delays. New methods of processing, publishing, and distributing information should be under active study in order to develop ways and means of presenting such material to medical teachers, research investigators, and practicing physicians in the most effective manner possible. Consideration should be given to the greatest possible application of digital computers and other electronic equipment, of photographic methods of reproduction, the development of abstract journals and services, noncommercial medical newspapers, and the use of radio, television, and other methods of communication.

INSTRUMENTATION RESEARCH

And paragraph E on page 95 of the report, under the heading "Instrumentation Research":

The remarkable developments in the physical sciences over the past 15 years have provided new tools and techniques permitting tremendous precision and speed of measurement, and new methods of analysis and processing of data which have only begun to be applied to medical research. There is a wide gap between these two areas of science which must be bridged by greater knowledge and understanding and the development of a common language for professional workers in both fields. The practical applications to medicine of new methods and equipment, including electronic and atomic techniques, digital computers, and so forth, provide challenging possibilities with great promise in measurement, record taking and processing, analysis, and diagnosis. Delay in implementing these possibilities has to a large extent been due to the fact that many of the new facilities and items of equipment involved are large, complex, costly, require specially trained personnel to operate, and are generally impractical for development in relation to any individual research project. Such facilities should be developed on a geographic basis in relation to large medical research centers and should be available to investigators working in various fields.

With your permission I should like to amplify these statements and perhaps illustrate them a little.

Senator HILL. All right, General.

NEED FOR COMMON LANGUAGE

General SARNOFF. In this discussion of bridging the gap between the physical and the life sciences, there is involved the need for a common language by which both sides could understand each other. It must be recognized that their present failure to understand each other is not due to a lack of intelligence on the part of either, but due to the fact that these are all new forces and new tools.

We speak of new tools and new knowledge, but I would like to call your attention, Mr. Chairman, to the fact that new tools also make possible the use of old. It is not merely new knowledge, but old knowledge which was useless until new tools were provided which could translate them into practical form. I might cite two examples.

FROM VACUUM TUBE TO TRANSISTOR

In the case of radio and television, for example, you know that we use the vacuum tube. It has three elements inside of it, a filament, a plate, and a grid. Until the advent of what we now call in the physical sciences "solid state physics," we knew of no way by which you could put electrons to work except by boiling them out of a vacuum tube which was heated to a certain point where the electrons passed from the plate to the grid. Along came the solid state physics and taught us that electrons pervade everything. They are in our bodies, they are in metals, and so on.

The question was how to get these cold electrons out of these metals without having to have a vacuum heated to incandescence. That knowledge produced what is now called the transistor and this transistor does everything the tube does, only does it better. It is, of course, more rugged and more stable. It is small and therefore takes less room. It is the transistor which really constitutes the major unit of reception and transmission in guided missiles and military apparatus, and now you can get transistors in radio sets or television sets.

We thought we did pretty well when we could find a crystal which would do that. But that really was old knowledge because, when wireless was first developed 50 years ago (and I am among the early birds in that particular development), there was only one way to receive a wireless telegraph signal, and that was by the use of a crystal. We used various crystals; they had different names; some of you may remember them, carborundum, silicon, perikon, cerussite, and so on. But these crystals were very inefficient. They were very insensitive and, when the tube came along, the tube replaced the crystals because of its greater sensitivity and its greater flexibility. It could not only receive; it could amplify; it could oscillate; it could do a lot of things. So we turned away from crystals and the knowledge of crystals; they weren't good enough.

EXPLANATION OF "TRANSISTOR"

Now, what is the transistor? The transistor is a crystal, too, but it uses a crystal called germanium. Germanium was in existence 50 years ago as well. It is a product of the earth. Now, through the knowledge which solid state physics has made possible by telling us how we could join things together, we are able to make the crystals perform not only as well as, but better than the tube. So we now have crystal detectors and crystal transmitters and crystal amplifiers, all due to the new knowledge or new tools which made old knowledge applicable.

I might give you a second illustration. The reason I presume to give you these illustrations is that I think they have very intimate relationship to the problems of medical research. The same philosophy, the same idea, the same principles apply there, too.

NEW TYPE AIR CONDITIONER

Some time ago I asked one of our physicists in the research laboratory of the RCA, which bears my name, to develop an air conditioner which would have no moving parts, which would make no noise and which would be simple in operation. When I asked for that he said, "Do you know how to do it? Can you conceive of any way by which you can have all these results without something moving, something stirring in the air, and so on"?

I said, "No, I do not have the knowledge of how to do it. I am not expert enough for that, but I have great faith in electronics. I think electronics can do a lot of things that formerly we thought were impossible, and I suggest that you take a look at the past as well as the future and see what you can dig up."

This was a man who had started with me in radio. He knew me very intimately and so he could allow himself liberties that perhaps others might hesitate to take. And he said, "Boss, it is wonderful to have an imagination like yours unrestricted by the slightest knowledge of facts."

That was a compliment which I deserved because of asking for a thing that did not exist.

Now, the punchline in that story is that several years later this same man who had paid me such a high compliment produced the result. He had thought about it for a while and this is how he produced it.

USE OF OLD KNOWLEDGE FOR NEW MECHANISM

He went back to the old literature and he found that 100 years ago a Frenchman named Peltier had actually written a paper in which he laid down the proposition that, if you take two dissimilar metals and join them together, you create a potential at the point of juncture, that is, you create electrical energy. That is where he stopped. The idea had no particular significance because there were no tools available that could make that potential useful enough to do anything. Now it is 100 years later, and this scientist I am talking about tried a transistor, a new tool, at such a point of juncture of two metals, and there he found that by doing certain things and in certain ways, technical things with which I need not trouble you, he could not only create that potential, but he could regulate it. If the current flew in one direction, there was heat. If it reversed in the opposite direction, there was cold. So with that knowledge, old knowledge, and new tools, he produced an electronic refrigerator, and I have actually been in a room in our laboratory which is all wired up with these transistors and dissimilar metals and, by throwing the switch could make that room so hot that I could not remain there or make it so cold that nobody could stay there.

Now, this type of development will be applicable to electrical appliances for the home, refrigerators, air conditioners, and so on. These are not quite at the commercial stage, but they are in what we call the developmental stage. The problem now is to reduce those devices to simple dimensions and to economical prices, and what do we find there? Still research. The story is still one of research. We find there that we do not need to have another new principle. We do not need to have new knowledge about how to make a principle work. But in order to make it economical and feasible, what we need is a new type of metal that will be efficient and will not lose energy. We are therefore looking for new types of metals, new materials, and what started out as a wireless proposition and became an electronic development, is now a metallurgical problem. The people we are depending on to find the solution to this problem are metallurgists who are working in this field of solid state physics.

That philosophy applies with equal force to research and development in the medical field, because the use of electronics, the use of atomics, the possibilities of radiation and so on, call for a widespread and diversified knowledge not merely among medical scientists, but also among the physical scientists.

NEW TYPES OF ELECTRONIC INSTRUMENTATION

In that connection in the field of instrumentation, a subject we have been discussing with the medical experts for some time, you will be interested to know that in July of this year there is being held in London an international exhibition on medical electronics. And at that exhibition practically all countries of the world having any interest in scientific development and research will be present and make exhibitions.

The conference itself is being organized by the electronics and communications section of the Institute of Electrical Engineers in London. Doctors, biologists, and electronic engineers from all over the world are being invited to attend.

The proceedings are designed to appeal not only to the medical and the electronic experts, but also to those who, though not themselves specialists, wish to get a general background for the many new techniques.

It is expected that from this meeting new methods of measurement and control of diagnosis and treatment will emerge to help the sick.

What does all this mean?

It means new tools, new manpower, new experts, new facilities, and of course money.

In the field of computers, for example, the ability of these electronic computers to correlate, to analyze, and to provide information of the sort collected by individual physicians, by clinics, by hospitals, and so on, could produce results of inestimable value, because it is from a relationship of one fact to the other that we learn new facts and are able to apply new remedies.

MODERN COMMUNICATIONS FOR MEDICAL CENTERS

There is a great need for the development in large medical centers of these modern instruments of communication which will find ways of processing such information for the professional practitioners, all for the benefit of mankind.

I shall rely on my associate here, Dr. Rigler, to tell you something of the specific applications in the field in which he is an expert.

I associate myself wholeheartedly with the conclusions and the recommendations of this Committee with respect to communications and instrumentation.

Senator HILL. That is certainly a most interesting statement, General. You spoke about this exhibit in England. It reminded me that many, many years ago Edmund Burke said that a politician who does not understand his trade sells his tools. So what you are telling us today is that we must not sell our tools. We must make use not only of those we have, but we must continue to work and to strive to obtain better, more effective tools and more tools.

You presented the case in a most challenging way. We certainly appreciate it.

INSTRUMENTATION RESEARCH

Dr. RIGLER. General Sarnoff has covered this subject, but I should like to cover a few points, particularly in the field of instrumentation. I happen to be a radiologist, and I assume that is why this task was given to me, since this specialty depends almost completely on an instrument or a group of instruments.

PROGRESS IN X-RAY

I might illustrate by pointing up the progress in X-ray. This has been tremendous when you consider that the first X-ray plate of a hand was made in January 1896. At that time it took some 40 minutes of exposure time; that is, the individual had to hold his hand still for over 40 minutes to have the plate fully exposed. If we want to do this today, we can do it in one one-thousandth of a second.

This sounds like a spectacular advance, but actually most of us are quite dissatisfied at the progress which has been made, since there are so many other areas in which much more could be done. We

have utilized only to a minute degree the potential that General Sarnoff spoke of, which is present within our environment at the present time—electronics, engineering developments, and so forth.

NEED FOR NEW TYPE FLUOROSCOPE

General Sarnoff spoke of solid state physics. We need badly a new type of fluoroscope, which could reduce the amount of radiation needed and improve our diagnostic ability enormously. By the utilization of solid state physics, this is certainly possible.

In fact, in General Sarnoff's own company, some research has been done in this field. Unfortunately, most medical instruments do not have very great economic value by their very nature. As a result, it is difficult for a corporation to undertake an enormous program in this field because the limited distribution of the instrument and the difficulties in finding any hospital which can afford one make it quite uneconomic.

ELECTRON MICROSCOPE

My own hospital has recently been given a gift whereby we bought an electron microscope which cost about $30,000. I think General Sarnoff probably did not mention this out of modesty, but the electron microscope was developed by his own company in this country. I might say that the Public Health Service, through the grants from the Federal Government, has made it possible for many groups to acquire such electron microscopes throughout the country, and this has improved both our research and diagnostic ability enormously.

The real problem comes back to the fact that the development of such instruments is not economically profitable and, therefore, we need public funds to promote such development.

I might add a few more things about these additional instruments. The electron microscope is, of course, by far the best example. Its extraordinary ability to magnify objects has made it possible to see viruses for the first time. Much of the research on the polio vaccine, and so on, has resulted from this. It is very possible that some new developments in the cancer field will come directly through our ability to utilize the electron microscope. There are a great many other areas of application that you can all well imagine.

I was once personally concerned with an instrument which a number of us worked for several years to develop. The purpose of this instrument was to make X-ray examinations of the chest more easily possible. But unfortunately, when it came time to develop this instrument for the market, the company which was helping us gave it up because it cost a great deal of money and needed a lot of technological help, and because it didn't appear that they could get a profitable return.

NEED FOR PUBLIC RESEARCH

The important thing that we want to bring home is that we should not rely entirely upon industrial organizations, upon corporations, for developing these instruments, that public funds also are necessary for this purpose.

For this reason, the Committee is recommending that funds be appropriated in an approximate amount of $5 million to initiate the establishment of centers in which new developments in the physical

sciences permitting increased speed, accuracy and complexity of measurement, can be applied to medicine.

Senator HILL. Doctor, Senator Stennis here is one of the most distinguished and one of the most indefatigable members of the Senate Committee on Armed Services and the Appropriations Subcommittee on the Armed Services.

What you are saying is that, just as we cannot rely for our defense entirely on the many fine contributions that private industry makes, but have to use p ıblic funds to develop some of these things we need so in the same way we must go forward with public funds supplementing private industry to obtain these developments for the health and strength of the people of our Nation; is that right?

Dr. RIGLER. You have put it very well.

Senator HILL. If I put it very well, all I did was summarize a very excellent statement from you, sir.

INTERNATIONAL EXHIBITION

Mr. JONES. General Sarnoff made reference to an international exhibition in London which points up the concern of this committee that there likewise be research money available to support translation services for research purposes, so that the scientific knowledge of the entire world will be generally available in our research effort.

DEFINITION OF TERMS

Mr. Chairman, I should like to read a note that appears on page xi in our report which says:

> The terms "medical research" and "medical education and training" are broadly interpreted by the committee to include educational research and research training activities in such institutions as schools of medicine, osteopathy, dentistry and public health, universities with strong programs in the life sciences, independent hospitals and research institutes. The term "practice of medicine" is intended to include the practice of dentistry and osteopathy.

DENTAL RESEARCH

I should have made this comment earlier in the presentation. This, however, is an introduction to the next topic, which is a discussion of a categorical program, that of dental research. Dr. Harry Lyons, dean of the School of Dentistry of the Medical College of Virginia, will speak in general terms of the program of the National Institute of Dental Research.

Senator HILL. Doctor, we will be happy to hear from you.

NATIONAL INSTITUTE OF DENTAL RESEARCH

Dr. LYONS. Mr. Chairman and members of the subcommittee, I am sure, Senator Hill, when you named this committee of 12 people, you were aware of the fact that you deliberately named five Southerners to the membership, and I hope you will be pleased to learn that the five southern members of this committee have been very tolerant of the "Damn Yankees" and the Westerners.

It is also gratifying to me personally that you saw fit to name a Southerner as the chairman of this committee. I am sure I speak for the other 10 members of the ranks in stating that he has been an

extremely competent chairman. Under his leadership, the five Southerners have been completely successful in persuading the other members of the committee to adopt unanimously this report which, while written in the English language, has a very definite southern accent.

Speaking for myself as a dentist, I am particularly gratified that this committee saw fit, again unanimously, to include the dental diseases as dread diseases.

Senator HILL. Did you ever sit in a dentist's chair, Doctor?

Dr. LYONS. I understand from some sources that some people view dentists as rather dreadful people.

Senator HILL. Not the dentist; just the disease.

Dr. LYONS We might ask ourselves why are certain diseases labeled dread diseases Well, heart disease and cancer are dread diseases because they kill so many people in such horribly dramatic fashion.

CATEGORY OF DENTAL DISEASES

But, on the other hand, arthritis and the diseases that lead to blindness are dread diseases for other reasons. They don't kill as dramatically as do heart disease and cancer, but they cripple, deform, and reduce the usefulness of people to the community, to their families and to themselves. They do this in a rather slow chronic fashion but, nevertheless, to a very important and dreadful degree. The dental diseases belong in this general category.

We might now ask ourselves, specifically, why are the dental diseases really dread diseases? Well, they are dread diseases for many reasons.

EROSIVE ROLE OF DENTAL DISEASES

The first is that the dental diseases are diseases of mankind. They not only destroy the dental structures, but, by creating portals of entry to the body, they make possible the onset of many other diseases elsewhere in the body of both a chronic and an acute infectious nature.

Were it not for dental conditions which create these portals of entry, we would be spared many other so-called systemic diseases. The dental disorders are also dread diseases because the lesions of dental caries and the peridontal diseases are not self-repairing conditions. As an example, if an individual suffers a cut, abrasion or a stab wound, in 2 or 3 days the body repairs these types of injury. But the portals of entry into our body created by the dental diseases are not self-repairing and do not heal until after the tooth is lost by one pathologic means or another, or until the dentist comes along and offers his successful therapeutic measures.

So the dental diseases have very profoundly important relationships to systemic welfare.

SYSTEMIC DISEASES MANIFEST IN DENTAL FIELD

I might also state that the corollary exists, that many syetemic diseases manifest themselves in one way or another in the dental field affecting the health and welfare of the dental structures.

The dental diseases are also dread diseases because they are the diseases of the highest incidence and the widest prevalence of all the diseases to which man is heir. Dental caries involves approximately

95 percent of all the people in the United States. If you live long enough, everyone suffers one type of peridontal disease or another.

The horrible deformities of cleft palate and harelip, Senator Hill, in which you are so interested, afflict one out of every 800 live births in the United States, and the dentists, unfortunately, have a great responsibility in the reconstruction of these deformities. The dentist also views, potentially, 12 percent of all the malignancies that occur in the mouth area, because they occur in the dental field, if we include within the purview of the dentist the tongue and the lips.

COST OF DENTAL DISEASES

Dental diseases are to be dreaded because of the cost. In any one year in recent times, only 40 percent of our population applied for and received some type of dental care. To be sure, often that dental care was only emergency treatment. In a great many instances we are led to believe that the care asked for and received was far short of adequate. Yet, that volume of dental care cost the American people approximately $2 billion last year.

Our able chairman referred to the fact that the public, on a private basis, spends $15 billion for medical care, and that the Government spends an additional $5 billion. That totals $20 billion for health care. Of this $20 billion, approximately $2 billion is spent for dental care. Thus, 10 percent of the total health bill paid by the Government and the people individually was for dental care. That gives you some idea of the magnitude of the dental disease problem.

FUNDS FOR DENTAL RESEARCH

In light of the $2 billion expenditure for dental health, it is interesting to note that this committee is suggesting an appropriation for research under the direction of the National Institute of Dental Research of only $16 million. This is a realistic figure for today, and I might indicate to you that the American Dental Association is wholeheartedly in support of this figure. However, I think you should know that the American Dental Association and others in the field believe that this is a low level of support, and that as we progress in our research effort, much larger funds will need to be appropriated.

I might indicate to you that, by the available treatment methods of curative and restorative dentistry, utilizing trained manpower available now, or that may be foreseeable in the future, we cannot begin to meet the needs, or what might be soon the demands, of the people for dental care.

ACTIVITIES NECESSARY FOR FUTURE

We must do a number of things. We must increase the productivity of the existing dentists and those likely to be available to us in the future through a training program of dental auxiliaries, and you are asked to make a substantial contribution to that. By dental auxiliaries I mean trained chairside assistants and laboratory technicians who can increase tremendously the productivity of the individual dentist.

FUNDS FOR PREVENTIVE MEASURES

You are asked to support research designed to provide preventive measures for these widespread diseases. I might indicate to you that we have just in recent years developed the first important preventive measure, again under the fine leadership of the National Institute of Dental Research. I refer to fluoridation of public water supplies which, for a per capita cost of from 8 to 15 cents, can wipe out two-thirds of all of the carious lesions in the mouths of children, and dental caries are primarily diseases of childhood.

We may, for this small cost, wipe out two-thirds of the portals of entry that these lesions develop in the bodies of our younger people.

DENTAL CARIES

Reported just last February is a new concept of the causation of dental caries, based on a finding from research on hamsters in which it was shown that, in these animals, a specific type of organism is related to dental caries in a causative way.

Based on this, there is a strong suspicion that dental caries is a transmissible disease which may well explain why 95 percent of our people have it. It is conceivable that, through the extension of these findings by research, it may be possible to develop a vaccine that would immunize our population against dental caries, at a saving in money, human suffering, and loss of hours of productivity in industry, that is beyond our concept.

I emphasize again that the committee is recommending only $16 million for the National Institute of Dental Research at this time. It is probable that much larger funds will be needed in the future.

DENTAL RESEARCH AND MANPOWER

Lastly, I should like to orient research in the dental diseases to the manpower story, both in connection with defense and industry, because I am sure you are aware of the fact that the two are related.

During the last World War, World War II, the United States sought to man its military enterprise through a military draft, and in the course of examining the young men of this country, many hundreds of thousands were deemed to be physically unfit to defend their country.

Of these many thousands, almost half were deemed to be physically unfit because of dental defects. The only requirement in the dental field was that a draftee have a minimum of three teeth above touching three teeth below. In order to put 22 million men in uniform to win the last war, that minimum dental regulation had to be deleted, and in the last months of the war young men in this country who were totally toothless were put in uniform, and the Dental Corps of the military services were given the task of supplying them with teeth after they were inducted.

You will be interested to know that that horrible story prevailed as late as 1945. The same story prevailed in 1918, 25 years or more before. No progress was made in reducing the incidence and the prevalence of the dental diseases between those two wars because we had practically no research going on in the dental field in the general realm of prevention.

RECENCY OF DENTAL RESEARCH

It is only since 1946 that we have begun to have active research in the dental field which should emphasize the fact that dental research is a "Johnny-Come-Lately" in the field.

Through the prevention of dental caries resulting from widespread fluoridation, it is quite possible that, in the future, the manpower needs of the military services and the industries which are related to the defense of our country would be met. The correction of that one great source of dental disease could be responsible for providing a greater pool of manpower to produce the weapons of war and to man these complicated defense devices.

I believe, Senator Hill and members of the subcommittee, that this is all I should say at this time, except to indicate to you that the dental schools of this country, if given research support and support for training programs, are champing at the bit to make progress in this field of dental research, and we bespeak your support.

Senator HILL. As a dentist, do you wish to use the term "chomping at the bit"? Doctor, you have certainly spoken eloquently and beautifully for dentistry. You certainly have.

Are there any questions, gentlemen?

Senator STENNIS. No questions, except this: that this is very, very impressive to me, Mr. Chairman.

I think you have rendered a great service, Doctor, on this committee. As I understand it, from 1918 to 1945 there was no appreciable improvement in the incidence of dental defects in our young men; is that correct?

Dr. LYONS. That is correct. There was no improvement whatsoever in the dental health status of the population of the United States as reflected in its young men.

Senator STENNIS. Well, you would most likely find improvement in that group if there had been any progress, wouldn't you?

Dr. LYONS. That is correct.

INCEPTION OF PROGRAM

Senator STENNIS. You have a program, though, of constructive dental research that started a few years ago. How was that started?

Dr. LYONS. It was started, Senator, mainly by virtue of the fact that you established a National Institute of Dental Research and you have given that institution fine support. You have given it funds within its ability to utilize them. We are asking you for additional support now because the National Institute of Dental Research is prepared to utilize additional sums effectively.

Senator STENNIS. And appreciable headway is already being made?

Dr. LYONS. In a very significant way.

May I be pardoned for intruding another facetious comment? I have enjoyed tremendously the opportunity of working with this Committee, but I sense that the Committee at times was considerably annoyed with its one dental member, because maybe about 15,000 or 20,000 times I suggested we include the phrase "and dental".

ANCIENT REMEDIES

Senator STENNIS. May I just comment on this late start? I was in Athens, Greece, a few years ago, and went where Socrates drank

the cup, and stood under the tree where he was supposed to have talked; and on over to Rome, where Caesar fell. I thought many times, "What in the world did they do for dental surgery and what happened to a man if he had an abscessed tooth in that day?" Was there any relief? What was the situation?

Dr. LYONS. One avenue of relief was through the services of the surgeon barber, who was the forerunner of our magnificent surgeons of today and the dental surgeons of today.

The alternating red and white circular stripe that is symbolic of our modern barber was developed from the bloody bandages that the barber used when he amputed legs and so on.

Senator STENNIS. Did they have the practice of drilling and filling a tooth in that day?

Dr. LYONS. Yes, sir. There are evidences in mummies that restorative dentistry was practiced.

Senator STENNIS. I thank the Chair.

Senator HILL. Doctor, you have spoken of these earlier barber-surgeons. My father, who was quite a student of medical history, used to tell the story of how some of them, although not all, would take a dog along to their operations and put the dog under the operating table. Then if they cut out the wrong thing they would slip the evidence to the dog and he would destroy it. Of course, that was in the long ago.

INFLUENCE OF DENTISTRY

Dr. LYONS. Mr. Chairman, may I just take a minute of your valuable time to tell you an interesting story about the widespread influence of dentistry beyond the field of health care?

A Richmond minister went into missionary service in the Belgian Congo and he became interested in the dental problems of the natives there. Every 2 years he came back to Richmond and we were privileged to supply him and his family with dental care in our clinic at the dental school. He told us something about the problems of the natives. We taught him conduction anesthesia, showed him how to remove teeth and guided him in the purchase of a few forceps. He then secured the consent of the Belgian Government to serve these people as an itinerant dentist.

About 20 years ago he came back on an occasion and he said, "You know, these natives have a pretty horrible practice. They knock out the two upper front teeth when boys are 19 years old and that is their symbol of having attained maturity. For those who have accepted Christianity, I certainly would like to give them their two front teeth back."

So we taught him how to make a simple prosthetic appliance to replace those two teeth. He came back 2 years later and said, "You know, that prosthetic appliance has been a more successful and persuasive Christianizing device than the Holy Bible."

Senator HILL. Doctor, I want to say again that dentistry was certainly ably and eloquently represented here today. You have made a fine statement.

Dr. LYONS. Thank you.

Senator BIBLE. Might I ask the good doctor one question?

Senator HILL. Certainly.

EFFECTS OF CARBOHYDRATES ON TEETH

Senator BIBLE. I not only wish to compliment him on his impressive statement, but to ask a question. For years we have heard that the main culprits, and also probably the main aids of the dental industry, were candies, bubble gum, and that sort of thing. Is this still the truth?

Dr. LYONS. Partly, in that these so-called readily fermentable carbohydrates provide the food materials for the organisms responsible for exciting the disease of dental caries. But while they are important factors, they are not the factor. For instance, I happen to be immune to dental caries and I can eat cake and candy by the pound, and I may drink Coca-Colas by the dozen without influencing adversely my dental status. You are correct in stating that there is an important relationship. However, it isn't the one causative factor by any means.

Senator BIBLE. I suppose we spend many billions of dollars on candy and gum and that sort of thing, many times more than we do on medical and dental research.

Dr. LYONS. That is a statement that would have to be qualified considerably. Let us bear in mind that there are uses and abuses of everything. The body gets and metabolizes usefully some readily fermentable carbohydrates, including sugars. It is the abuse of these food elements that we must view with concern.

Senator BIBLE. I am very glad to get your observation, Doctor, and I think you have made a most impressive statement. Thank you.

Senator HILL. We certainly thank you.

Mr. Jones?

NEED FOR ADDITIONAL DENTISTS

Mr. JONES. Returning for a moment to our discussion of medical manpower, I should like to invite the attention of the subcommittee to the fact that this problem relates directly to the dental profession also, the need for additional dentists and additional dental schools being approximately as acute in relation to the total complement of dentists in the country, as is the need for more physicians and medical schools.

HEART DISEASES

The next topic that we would like to discuss has to do with the categorical area of heart diseases, the research toward solution of which is carried out primarily through the National Heart Institute. We have asked Dr. De Bakey to lead this discussion.

NATIONAL HEART INSTITUTE

Dr. DE BAKEY. You are, of course, Mr. Chairman and members of the subcommittee, fully aware of the fact that the diseases of the heart and blood vessels constitute by far the most common causes of illness and disability in our country. Indeed, they actually account for more deaths than all other diseases combined.

So the importance of cardiovascular disorders as dread diseases, requiring intensive research, needs hardly to be further emphasized. The National Heart Institute, as you know, was established approximately 12 years ago. I think it is more than a coincidence that the

advancements made during the past decade in this field of endeavor far surpass all previous efforts.

In fact, I am convinced, and I think many others who are much more knowledgeable in this field than I are convinced, that these truly striking advancements that have been made in our knowledge in this field are largely due to the basic support provided for research through the National Heart Institute.

This constitutes the major institute through which funds which have been provided by your subcommittee and the corresponding committee in the House of Representatives to support research in this field. The effectiveness of research moneys in advancing our knowledge in this field has been amply demonstrated.

AREAS OF PROGRESS AT NHI

The program of activities in the National Heart Institute is broadly divided into two areas, the intramural and the extramural programs. We have had an opportunity to evaluate both of these programs, the mechanisms for achieving them, as well as the funds that are available for those purposes, and we are convinced that these funds have been used quite effectively, and that satisfactory mechanisms for their administration have been developed.

INTRAMURAL PROGRAM

So far as the intramural program is concerned, we feel that, in general, the activities that are being carried out at the National Heart Institute and in the clinical center in this field of research are of a very high order of quality.

As in most other intramural activities, we are in agreement that there is little need to expand these activities at the center. There is need, I think, to support these activities in terms of improving their quality and the personnel that are available to them.

There are certain activities of the National Heart Institute which, from time to time, will change in emphasis, as new knowledge becomes available, and there are certain activities that I think do need additional support.

One of these, for example, is concerned with the need for reference standards and standard methods for analysis and assay of biochemicals and biologicals used in this particular area of medicine.

It is interesting that there is no agency currently responsible for preparing or supplying some of these materials. The Heart Institute, in collaboration with the laboratory of hematology and biochemistry at the Communicable Disease Center, has made a start in this direction in a rather small way, but one which I think needs further support and emphasis. They have, in preliminary work, established the importance of such standards and are developing experience in providing them.

CHOLESTEROL DETERMINATION

For example, they have developed a standard for cholesterol determination, and have developed it as a laboratory reference procedure. There are several other materials; in fact, I am sure many others will develop as our research knowledge in this field expands; the abnormal hemoglobins, for example. I shall not go into the detailed needs of

these, but merely to indicate that they are important materials, testing materials, that are used in actual research activities.

The Heart Institute and the Communicable Disease Center have now developed some experience in the establishment of these standards. Some of the funds which have been requested for the direct operations of the Heart Institute would provide money to expand these activities in the establishment of standards for research materials.

GERONTOLOGY

In the field of gerontology, the Heart Institute has also, I think, had a long period of experience, despite the fact that this is a field which only in recent years has come to be recognized as a truly important one for research work.

Some of the fundamental work in the aging processes has been under the direction of Dr. Nathan Shock in Baltimore, at a laboratory for the specific purpose of the study which has been carried out under his supervision at the Baltimore City Hospital.

Dr. Blalock may wish to supplement the comments I will make about this, since he is more familiar with the work going on in that hospital, and with their facilities.

The points I wish to make in this regard are that this is a very important area of intramural activity in the Heart Institute, one that deserves a great deal of emphasis, because the study of the aging process is, I think, important to all of us.

If we are able to control some of the diseases which kill individuals before they reach old age, then all of us are going to look forward to reaching this period. So the activities of this group in gerontology should receive generous support.

Their needs are particularly concerned with more adequate facilities, particularly for laboratories. Here I think it is important to provide funds for the construction of these facilities.

EXTRAMURAL PROGRAM

So far as the extramural program of the Heart Institute is concerned, the larger funds which have been made available each year have, I think, been most effectively used in the expansion of research activities on the heart and blood vessels. There is simply not enough time available to point out all the benefits which have been derived.

Particularly important, I think, other than the advancement of knowledge which has been gained, is the truly great progress which has been made in the control of any number of diseases of the heart and blood vessels, the fact that personnel have been trained in this field to do research and to expand and intensify the research activities in this area.

This, to me, represents one of the most striking developments in this field. Anyone who has an opportunity to travel across this country and visit institutions where these research activities are going on cannot help but be excited and truly enthusiastic about the work that is now going on in this area.

I think we can look forward to some truly important developments that will soon become available, if not in actually advancing our knowledge in the control of some of these diseases, at least in providing us more effective approaches to them.

ATHEROSCLEROSIS

In the field of atherosclerosis, for example, which constitutes one of the basic diseases of the cardiovascular system, has occurred one of the most exciting developments. We have had to revise and, indeed, almost revolutionize our concept of atherosclerosis in the last 2 years.

Not too long ago this was considered a disease of senescence, but that concept has been completely thrown overboard. Now we realize this is a truly complex disease, a vital disease, and one that can be attacked on many fronts in terms of determining its causation and perhaps its prevention.

Expansion of the extramural and intramural research programs of the Heart Institute, along with the training programs will, in the opinion of this committee, require an appropriation of approximately $88,300,000 in fiscal year 1961, an increase of approximately $24,000,000. This concludes the remarks that I would like to make in connection with the Heart Institute.

Mr. JONES. Dr. Blalock, do you have any additional comment?

THE NATIONAL HEART INSTITUTE

Dr. BLALOCK. Mr. Chairman, I will be brief. I agree with everything that Dr. DeBakey has said. I have been a consultant to the Heart Institute for several years. I have studied their intramural program thoroughly and believe it to be superb in every respect.

I think Dr. Watts and Dr. Berliner are doing excellent jobs. Dr. DeBakey mentioned the intramural program at the Baltimore City Hospital under the direction of Dr. Shock. Even though not in Bethesda, this is part of the intramural program. It is housed in miserable facilities, and I hope that some money will be forthcoming with which to give them better laboratories.

The problem is a rather complicated one in that this is a direct operation of the National Heart Institute in collaboration with the investigators of the Baltimore City Hospital. I think that a special effort will have to be made to direct some funds for a building in that direction.

Dr. DeBakey commented on the need for solving the problem of atherosclerosis, and similar comments could be made about the need for further information about the etiology and treatment of high blood pressure. Significant strides have been made in recent years. There are agents for treating high blood pressure that in many instances are quite effective; medical means that in many instances have obviated the need for operations.

CONGENITAL HEART DISEASE AND RHEUMATIC FEVER

There have been significant strides in the etiology and treatment of rheumatic fever, but additional information is badly needed. There have been some contributions to the prevention of congenital heart diseases, and many contributions to the treatment of congenital heart diseases, but there is a need for additional information, both regarding prevention and treatment.

I think that the intramural program at Bethesda is superb, and I hope that the extramural program can be supported more adequately than at the present time.

Thank you, sir.

Senator HILL. Are there any questions?

If not, you gentlemen have talked on a most important matter and you have certainly brought us some very fine and very impressive testimony. We know the progress you have made up to date, but how much more there is yet to be done. You have certainly told us that story in an impressive fashion and we deeply appreciate it.

Mr. Jones?

Mr. JONES. Mr. Chairman, I failed to note in advance that we had promised General Sarnoff that he could be excused to catch a plane.

Senator HILL. We are sorry to see him go, but we understand perfectly.

Mr. JONES. We will have nine of our members back with us in the morning. To be certain that we hear from those who will be here today, but perhaps not tomorrow, we have adjusted our program accordingly.

ALLERGY AND INFECTIOUS DISEASES

We would now like to turn to the problems of diseases that are handled, researchwise, through the National Institute of Allergy and Infectious Diseases. We have asked Dr. Farber to lead the discussion on this topic, to be supplemented by Dr. Blalock.

Senator HILL. All right, Dr. Farber.

NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

Dr. FARBER. It is my pleasure to speak for your Committee of Consultants concerning the National Institute of Allergy and Infectious Diseases. There is no member of the Committee who spends all of his time working in the field of allergy and infectious disease, but all of the professional members of the committee, Mr. Chairman, are deeply concerned with infectious disease and with allergy in their own fields, and all of those who are conducting research use the techniques of infectious disease or are concerned with problems of infectious disease as such disease affects their own fields of activity.

INFECTIOUS DISEASES IN LEUKEMIA PATIENTS

For example, the leading problem we have in the field of acute leukemia in children, next to the problem of leukemia itself, is the problem of infectious disease which causes death in these children who have no resistance to bacterial infections. Bacterial infections which ordinarily are not of much consequence to the normal person can constitute a threat which leads to death during the stage of relapse in that disease.

FIELD OF ALLERGY

In the field of allergy we associate that term with hay fever and nuisances of that kind, but there are more than 17 million people known to have some allergic disturbance of importance in this country at any one time. But this field goes far beyond hay fever. We look to hypersensitivity associated with the streptococcus as the basic mechanism of importance in the causation of rheumatic fever. There are diseases of small arteries all over the body caused not by bacterial infection or disease agents located directly in the small vessels, but the mechanism here is a hypersensitivity secondary to bacterial infection or chemical change somewhere else in the body.

There are diseases of the brain, of the kidney and of the liver of great importance in the causation of chronic disease which are all associated with this basic mechanism of allergy or hypersensitivity.

COMMON COLD

In the field of the common cold, we are confronted with the problem of some 284 million instances of disability caused by upper respiratory infections in the year ending in June of 1958. This was associated with the cost of medical bills alone of $3 billion, with many billions more lost to industry through absenteeism, and the rest we cannot calculate.

I would quote here that the sum of $1,736,000 was allocated in the budget for the development of vaccines against a problem of such tremendous enormity. The whole field of tropical disease, and infectious disease of many different kinds falls within the field of activity of this Institute.

In addition, in the past few years there have been three programs of great importance which I would like to mention—and I do not mean to neglect others—concerned with immunology, viruses, and with cell biology. They are programs of great imagination, carried out with gratifying productivity. I am referring particularly to those programs carried out in Bethesda, but I refer also to the large amount of splendid work carried out through the NIH grants program in many parts of the country.

DEVELOPMENT IN CELL BIOLOGY

In the field of cell biology, for example, there has emerged the technique of tissue culture which came from the field of general biology, went to cancer and from cancer came to infectious disease. There, Dr. Harry Eagle has given us a technique which is of tremendous importance not only in his own field of infectious disease, but also as a tool for the evaluation of chemical agents useful against cancer in man.

VIRUSES

In the field of viruses in this Institute, the work of Huebner, another name I select as an example, not to the neglect of anyone else, but because I have particular knowledge of this program. He has, I think, the largest and the most effective program in the world today concerning the nature of viruses and their identification and classification.

Since we are now in a period of tremendous interest in the field of viruses and cancer, this work in the Institute of Allergy and Infectious Diseases has great importance to the field of cancer.

It has been estimated that more than 100 new viruses have been found in man during the last 10 years. As General Sarnoff pointed out, these, like electrons, were not new, they were there before, but we had no knowledge of their existence. These viruses affect man, and their complete classification has not yet been worked out.

TROPICAL DISEASES

The programs concerned with tropical disease are of particular importance at this time because, as we all recognize, we are living in the world, not merely in the United States. With transportation, trade and industry, having given us responsibilities throughout the world, tropical medical problems are problems of everyday importance throughout the cities and towns of this country.

We were much interested in the splendid reports of the Director of this Institute, Dr. Justin Andrews, and of his colleagues, in their hearings before your subcommittee and the committee of the House.

We have read these in great detail and with much satisfaction. The members of our committee were disturbed, however, when in the concluding statement of the report presenting his program, after mentioning figures of tremendous importance in the various kinds of infectious disease, cystic fibrosis, tropical disease and all of the other many problems to which I have referred, Dr. Andrews stated that the budget proposed by the administration for 1961 would enable the Institute to carry on the programs being carried on in 1960.

ADDITIONAL FUNDS REQUESTED

The committee is recommending an increase of $14,180,000 over the 1960 appropriation for this Institute in order to enable it not only to carry on the programs carried on before, but to explore these new and important areas concerned with viruses, with cell biology, with microbiology and bacterial infections in general, with immunology, and also to support to more adequate extent than in the past, the Gorgas Memorial Laboratory in the Republic of Panama. This is an extremely valuable laboratory for our country because it deals with tropical disease in a manner which is not possible in the United States. It is in no way in conflict with, and in no way duplicates, the activity of the Middle America Research Unit in the Canal Zone a few miles away. This Middle America Unit is concerned primarily with viral infections, and even when the programs of these two institutions appear to coincide, they are not actually duplicating one another. They are working in different ways, with different techniques, on problems of common interest.

EASTERN EQUINE ENCEPHALITIS

It is of interest that one problem worked on by both institutions this past year very effectively was eastern equine encephalitis. This disease is caused by a virus which is carried by insects, with a reservoir in small animals, in birds, and even in horses, and is thus carried to man.

This disorder was thought for many years to affect only horses, hence its name—equine encephalitis. But in Cape Cod in 1938 there was an outbreak of an infection in children, and then later in a few adults, of a kind which we had never seen before, occurring some few weeks after several hundred horses had died of encephalitis.

It was proved when a child of 8 years old died with such an encephalitis and the cause was found to be exactly the same virus that caused the horse disease. Since that time we have known it is one more threat affecting man.

PROGRESS IN INFECTIOUS DISEASE CONTROL

The great importance of emphasizing the program of this splendid Institute is that infectious disease represents one area of magnificent illustration of the results of medical research. The advent of the sulfonamides, the means of preventing diseases. Such as typhoid fever, diphtheria, and the like, and the antibiotics, have saved millions of lives and given great encouragement to research workers in all other fields. But the very success caused by these antibacterial agents and these antibiotics, served to give a false confidence throughout the the country that all problems of infectious disease are ended and that, indeed, infectious disease, as such, is a matter of the past.

The committee would like to emphasize that this is not the case; that research in this important field should be intensified, not only because of the enormous economic problems here, but because of the great cost in lives.

Even though the description of pneumonia as "Captain of the Men of Death," adapted by Osler from John Bunyan, is no longer applicable, infectious diseases remain an extremely important threat to the health of our people.

I would hope that Dr. Blalock would speak particularly concerning the resistant staphylococcus which has emerged to play such a huge role in surgery and hospitals and in the homes throughout the country.

Thank you.

Senator HILL. Dr. Blalock.

ANTIBIOTIC-RESISTANT STAPHYLOCOCCUS

Dr. BLALOCK. I do not think I should take your time, save to say that antibiotic-resistant staphyloccus infections represent one of the big unanswered problems. In some areas on occasions they have had to cease to perform operations for fear that this resistant staphylococcus would invade the patient as a result of the operative procedure.

Some of these staphylococci are quite resistant to all agents that we have at the present time. I will simply say that there is an urgent need for a great deal of research on the prevention of such infections and the finding of newer and better antibiotics with which to treat them when they do occur.

Senator HILL. Didn't we think at one time we had this staphylococcus infection pretty well licked?

Dr. BLALOCK. Yes, sir.

Senator HILL. Then they came back in renewed virulence, didn't they?

Dr. BLALOCK. Yes, sir.

Senator HILL. At Maxwell Field, Montgomery, Ala., they had to close the hospital down because of the infection. That happens with a good many hospitals It illustrates the fact that we thought we had this thing licked and then it came back It evidently built up an immunity to the antibiotics you were using on it and it came back.

Dr. BLALOCK. Yes. Antibiotics killed off those that were not so bad and left the resistant staphylococcus with no competition. So this resistant one takes hold of the patient.

Senator HILL. Are there any questions?

We certainly appreciate this testimony, Dr. Farber and Dr. Blalock. You keep building this case stronger all the time, gentlemen. We thank you.

Mr. Jones?

Mr. JONES. Mr. Chairman, we come to a topic of great interest, probably no more so than some of those already discussed, but certainly one of tremendous concern. That is the whole field of mental health. We have asked Dr. Cecil Wittson, who is, himself, a psychiatrist, to speak to this topic.

NATIONAL INSTITUTE OF MENTAL HEALTH

Dr. WITTSON Mr. Chairman, you and your subcommittee are well aware of the magnitude of the mental health problem, the pessimism of a few years ago, and the recent heartening developments in the field of mental illness.

During the past few years encouraging strides have been made toward the better understanding of the causes of mental illness and the development of new methods for the more efficient and economic treatment of these conditions.

Until a few years ago, the publicly supported mental hospitals were each year becoming a repository for an increasing number of the mentally ill. In the 115 years between 1840 and 1955, the mentally sick housed in our mental institutions increased about 200 times, far exceeding the population growth. The early concept of the asylum as a small, pleasant haven had, perforce, given way to the pressure for more and more beds.

New public hospitals had to be built and old ones enlarged. The small havens have become enormous institutions, with 1,500, 2,000, even 12,000 and 14,000 beds. Yet there was never enough room. Thousands of sick people were put on waiting lists

Custodial care prolongs illness and few could afford private care. Ninety-five percent of those hospitalized were in tax-supported institutions. Viewed in this light, the recent steady yearly decline in the number of patients in our public mental institutions is quite significant.

IMPROVEMENT OF PSYCHIATRIC TECHNIQUES

An important aspect of the recent advances has been the improvement of psychiatric techniques, making it possible for an increasing number of people to obtain private psychiatric care in their own communities with a saving to themselves and the public treasury.

Each new development which increases the efficiency of psychiatric treatment provides opportunity for more people to obtain this treatment in their own community, often without leaving their family or their jobs, so that they remain taxpayers rather than tax spenders.

Unfortunately, these developments have not been uniform throughout the country. Eight States, Kansas, Nebraska, Minnesota, Illinois, Iowa, New York, Massachusetts, Pennsylvania, are responsible for a large part of the national reduction in hospitalized mental patients.

These States with relatively vigorous mental health programs have more professional personnel and, consequently, their mental health programs have produced higher dividends.

For instance, the two States with the highest ratio of professional personnel per 100 patients have more than four times the national average decline in hospitalized patients. Conversely, the two States with the lowest ratio of professional personnel have an increase in the number of patients hospitalized.

The relative ineffectiveness of the mental health efforts in some sections of the country dilutes and distorts the national picture. Rather than to attempt an assessment of the impact of the federally supported program on all 50 States, it would seem more meaningful and valid to select as a benchmark one State which combined support from the State government with considerable support from the National Institute of Mental Health. The one such State I select is my own, Nebraska, since I know the problems in that State.

NEBRASKA PROBLEM

Hill-Burton funds were used in the construction of its teaching and research hospital. Initially and subsequently, National Institute of Mental Health grants have been a vital factor in the development and progress of the State program.

A member of your committee, Senator Hruska, is quite familiar with the situation as it existed in Nebraska some 10 years ago. The State is indebted to Senator Hruska and several other leaders for their foresight and assistance in laying the base for our fight against mental illness.

In 1950 the situation in Nebraska was as it was and still is in many of our States. Hospital construction could not keep up with the demand for beds. For 30 years the State's population had been relatively static. However, the number of patients in its State mental hospitals had increased by about 200 percent. Yet there was a long waiting list of people who were sick and unable to obtain hospitalization because no more beds could be jammed into the halls and corridors of the institutions.

In 1951 a team of experts from a national organization appraised the situation in Nebraska and advised immediate construction of another 1,800 bed hospital. That would have cost the State about $12 million to construct, and another $13½ million to operate for a period of 5 years.

RESULTS OF PROGRAM

We did not follow their advice and, instead, embarked on a program of training and research. As a result, today, instead of having a projected 5,600 beds occupied in State institutions, we have only slightly more than 4,000. So the program in Nebraska has paid handsome dividends. Two and a half times as many people are being treated, yet we have 12 percent fewer patients in the hospitals than 4 years ago. Instead of adding the 1,800 bed hospital, we have been able to abandon some obsolete buildings.

Service to patients and reduction in hospital beds have in 5 years more than paid the original investment and the total operating cost of the treatment, research and training program. The only alternative to an aggressive maximum research and training effort is to build more and more beds to house the mentally sick.

HOUSE TESTIMONY ON ADDITIONAL HOSPITAL BED NEEDS

It is to be noted with, I think, some amazement and disappointment that in February 1960, testimony was given to the House of Representatives Subcommittee on Appropriations of the United States to the effect that the United States has a need for 420,000 additional mental hospital beds—420,000 beds would cost the taxpayers more than $4 billion to construct and at least three-quarters of a billion to operate each year.

Senator HILL. What was the date of those figures, did you say?

Dr. WITTSON. That was testimony given in February 1960. I believe it is on page 304, sir.

Senator HILL. Thank you.

Dr. WITTSON. More alarming to me than these billions which I can't comprehend, would be the perpetuation of the concept of custodial care with its attendant high cost and human suffering. These estimates were apparently based on an outmoded pessimistic ratio of 5 beds per 1,000 population. I can offer evidence that only slightly more than half of these beds would be needed if current and emerging knowledge were used to the maximum. Just a few years ago there seemed to be no valid alternative, but to build more beds. The problems of mental diseases seemed to be so great as to give rise to a feeling of hopelessness. Today we have concrete evidence that such pessimism is unjustified and that a maximum research and training effort could alleviate untold suffering, and strengthen the Nation's economy and defensive ability.

ADEQUACY OF TRAINING EFFORTS

As to the question of adequacy of our research and training efforts in the field of mental health, I must answer, and the Committee agrees, that we are still not doing everything that is reasonably possible to meet the needs for personnel or to develop new methods of treatment, or uncover the causes of these diseases. Although some definite progress has been made in psychiatric research, the investigation of the basic psychological, physiological and sociological causes is just beginning. I shall not describe to you some of the exciting developments which biochemistry, genetics, pharmacology, sociology, etc., are making toward the understanding and treatment of mental disorders, as this has been done for you by others. However, I should like to emphasize some special areas of opportunities and need.

MENTAL DISORDERS OF CHILDREN

The first relates to the disorders of children. There is a need for more effort to uncover the basic causes of mental disability in infants and children. We have made some important discoveries in isolating some of the causes of mental retardation. I wish the subcommittee could see the improvement and even cure which we can now bring about in some of the emotionally and intellectually handicapped babies. The country, however, has a dangerously acute shortage of child psychiatrists. There are less than 500 psychiatrists trained in child psychiatry in the United States. Even more acute is the shortage of physicians with special training in dealing with problems of retardation. Not one of our specialized hospitals for the retarded

has a fully approved training program, and only four have partially approved programs.

The psychopharmacological drugs, as you know, have brought about great changes in the care of the mentally ill. However, more work is needed to determine the basic action of these drugs, and the development of special centers for this study seems highly desirable. One existing center has been giving careful consideration to this and is now in a position to implement such a program if funds are available.

VARYING EFFECTIVENESS OF DRUGS

It must be remembered that these psychopharmacological drugs vary tremendously in their effectiveness. Even if an ineffective drug has no harmful effect, it nevertheless should not be administered on a large scale, because the administration of that drug would deny the patient the effects of a useful drug.

Alcoholism is a universal problem and one which creates a great deal of suffering and a huge loss to industry. Certainly every effort should be made to find ways of minimizing this disability.

We are all familiar with the distressing problem posed by the aging portion of our population. Work done so far would indicate that many of the disease conditions of the aged do not begin as irreversible disorders, and would be amenable to prevention and treatment.

The title 5 program has been one of the most fruitful developments in the field of mental health. The design for pilot projects leading to improved methods of diagnosis, treatment and rehabilitation of the mentally ill, and for improvement in the administration of psychiatric facilities has been helpful. It has served not only its original purpose, but a very fortunate and important secondary goal has been obtained; it has stimulated research in various areas of the country where otherwise it would not have occurred.

LACK OF FUNDS FOR APPROVED GRANTS

I might add that at present, although the approval rate by the title 5 committee has been quite low, there is a backlog of some $400,000 in grants approved for which there are no funds.

Earlier a member of our committee talked to the point of the need for communications research. This is specially applicable to the field of mental health. Many, if not most, of the large mental hospitals of this country are geographically and professionally isolated and meagerly staffed. The universities and other medical centers could give valuable aid to these hospitals, making it possible for them to improve patient services and develop training and research programs. Yet the medical centers cannot spare sufficient personnel for the long distances required in traveling to visit these institutions.

The use of some of the newer means of communications should be applied to the problem, thereby eliminating the need for travel to and from medical centers. For example, two way video transmission and telemetering devices could be used to close the gap between the universities and the more remote institutions.

STATE CONTROL PROGRAMS

I will not do more than mention the State control programs. These programs have been of great assistance to all of the States. As you well know, there simply are not enough psychiatrists and enough other mental health personnel to fill even half of our current needs. The shortage of professional personnel is vividly reflected in the staffing of State mental hospitals where the situation is critical. At the present time, 67 percent of the residents in training in State institutions are foreign graduates. Many of these doctors trained in foreign countries are excellent men with good training. But, as evidenced by the results of a national qualifying examination in March of 1960, a large number lack basic medical knowledge. Only 33.6 percent of those who took the March examination were able to demonstrate sufficient medical knowledge to be awarded a standard certificate. Yet many of the State hospitals are dependent on these graduates of some 533 foreign schools scattered all over the world.

This is, I think, a very unhappy and dangerous situation, whereby so many of our people are being cared for by persons of questionable medical ability. On the other hand, we have developed in this country training facilities, particularly those in the universities, which are able to attract an increasing number of American graduates from American medical colleges. Yet we do not have sufficient funds to implement fully the programs that these training institutions are now capable of providing.

The present budget of the National Institute of Mental Health allows for 650 stipends. The Institute has applications for more than 1,000 stipends. The total backlog in training applications which have been approved, but for which there is no money in fiscal year 1960, amounts to $7,600,000.

PROGRAM FOR TRAINING OF GENERAL PRACTITIONERS

I would like to call the committee's attention to one particular program which I think is proving to be quite successful although it is a very new program, and that is the program for training of general practitioners. Some 1,500 general practitioners are now receiving training in psychiatry. These doctors in general practice can and should assume an increasing role in the treatment of emotional and mental problems.

That, I believe, sir, will complete what I have to say

Senator HILL. Are there any questions?

Senator BIBLE. Might I ask just one question, Mr. Chairman?

Senator HILL. Certainly, Senator Bible.

OUTDATED COMMITMENT SYSTEMS

Senator BIBLE. I have always felt that the systems of commitment to mental institutions in many of the States were outdated and, in many instances, actually barbaric. Have improvements been made in that direction and along that line? This may be beyond the purview of the National Institute of Mental Health, but it is alarming to me to see or to witness some of the commitments that go on every day in America.

Dr WITTSON. You are entirely correct, Senator. The commitment procedure in many of the States is outdated, and, as you say, barbaric. I am sure that it contributes to the perpetuation of mental illness in many instances.

Senator BIBLE. Are recommendations made by the National Institute of Mental Health as to methods of improving the system of commitment, or is this a medical-legal problem?

Dr. WITTSON. It is a medical-legal problem, sir. Recently the National Institute of Mental Health, I believe under the title 5 program, gave at least one grant, in fact, as I recall it gave two grants, for a study of this medical-legal problem.

Senator BIBLE. I think it is a very important area and one that should be explored and implemented.

Dr. WITTSON. You are entirely right.

Senator STENNIS. Mr. Chairman, I want to ask just one brief question.

DEVELOPMENT OF NEW DRUGS

Doctor, I noticed your reference to the new drugs which you referred to that help some of these cases. I know a person in my home county that was in an institution for 30 years, and you came along with these new drugs and affected her case most favorably. She was out in a short time. As far as I know, she is still out. Are you still making new discoveries along that line?

Dr. WITTSON. Yes, sir. There are new drugs being developed almost every week, and that is one of the reasons we need to continue the expansion of our program of screening these drugs, and also to expand the basic research into the way these drugs act.

Senator STENNIS. There are still great fields to explore there, you think?

Dr. WITTSON. Vast fields, sir.

Senator HILL. In that connection, Doctor, I am reminded of what I believe to be the fact, that rauwolfia, one of your most effective drugs, came from India and lay dormant for 400 years, until finally some of it was tested, I believe, at a laboratory in Boston. Is that correct?

Dr. WITTSON. I believe it was originally tested in France and then came to this country.

Senator HILL. But here was this drug that lay dormant all these years that is now supposed to be such a great blessing, not only in the treatment of mental ills, but in the matter of high blood pressure. Is that correct?

Dr. WITTSON. Yes, sir.

Senator HILL. You have brought us a very splendid and informative statement. We appreciate it.

Dr. WITTSON. Thank you.

Senator HILL. Mr. Jones.

Mr. JONES. The next topic, Mr. Chairman, has to do with the diseases attacked through the research programs of the National Institute for Neurological Diseases and Blindness. We have asked Dr. Traeger, professor of medicine at Cornell Medical School, to lead this discussion.

Dr. TRAEGER. Many years ago before I became a doctor, I was a musician, and played the string bass in an orchestra. That string bass is the last man in the band. He is almost out of the band altogether. That is where I am now.

Senator HILL. Doctor, you recall that the Good Book says that "the first shall be last, and the last shall be first." All right.

NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS

Dr. TRAEGER. In order to talk to the problems of the National Institute of Neurological Diseases and Blindness, I would like to go back a little bit and ramble, with your permission, because I think what I have to say is pertinent to the operations of that Institute.

Health is people, and, as a practicing physician, I am interested in people. In an operation like this, we all have to operate or begin with a premise, and our premise is that sickness is an unnatural state, and certainly an undesirable state.

The entire history of medical education, the entire history of medicine, has been directed to the eradication and the alleviation and the prevention of sickness. We are still doing that. So our premise remains valid.

Now, why are we here? This Committee was constituted because the question was raised as to whether the Federal Government was spending too much money on medical research and whether the Government was spending it wisely.

Let us think about it in simple terms, not in terms of budgetary breakdowns. Our Chairman, Mr. Jones, has just told us that already the Clinical Center has reached its capacity. That only opened its doors 7 years ago and already we need more room.

I remember when it opened. It almost did not open because of a deep-freeze of funds. Well, we thought it was a magnificent edifice. Here, the scientific hopes of the Nation and the world were represented in one enormous building in which there were two laboratories to every sickbed. Where were our sights 8 years ago? In thinking of money, with respect to people and disease, we have learned this lesson already. Our sights 8 years ago were not nearly high enough.

40-YEAR PROJECTION

Let us think in terms of 40 years. What will medicine, research, the health of the people of the world be in the year 2000, if we are not blown up by a bomb? That seems like a long time away, but everybody here can remember back to 1920, and that is just as far back as 2000 is ahead.

Think of what has happened since 1920 in medicine and in surgery. Yes, even in dentistry.

We have all lived through this enormous and wonderful transition from the art of medicine to what is becoming now more and more the science of medicine. I can remember when we treated typhoid fever by dumping patients in tubs full of floating cakes of ice, and we gave them ice enemas.

TRANSITION TO NEW METHODS

I can remember when I questioned my instructor of pathology about an article I had read in a magazine on the treatment of pernicious anemia, which was then a 100-percent fatal disease, with liver, and he laughed at me.

Well, it was no laughing matter. It was true. Although we had to sweat through the long period of feeding people liver in 57 different

ways, we don't have to do that any more—pernicious anemia has been eliminated. I haven't seen a case of typhoid fever in 25 years, or cholera, or mastoids. I can remember when I was a young doctor I made my living from two types of disease—pneumonia and gonorrhea. A doctor who graduates today, if he depended on his living today from those two diseases, would starve to death. I can remember when the idea that you could cure pneumonia with a pill was considered outrageous. Well, it is true.

Now, how have all these things arisen? They have come from research. The difference between the discovery of insulin and its applicability lies in 15 percent of alcohol. The extraction of insulin could not be accomplished with 90 percent alcohol, but could be with 75 percent alcohol. It took several years to figure that out. But here we have insulin, and now we have oral medication for diabetes. All of this has come about because of research.

RETROLENTAL FIBROPLASIA

Let us think for a moment, again going back to the Clinical Center. I don't know exactly how much it cost to build the Clinical Center but we have already amortized that building three times over with one tiny little project, the work on retrolental fibroplasia. That one job has paid for the Clinical Center three times over.

Senator HILL. Doctor, I think I understand what that is, but for the sake of the record, tell us what it is. There will be members who read this testimony who will not have the opportunity to discuss it with you.

Dr. TRAEGER. That is a disease which causes blindness in premature infants. There used to be about 3,000 of these cases a year. These were human beings who would never see their mothers or fathers, never see a flower. It was found out through a collaborative study developed at the National Institutes of Health that these children had their retinas burned out by an excessive amount of oxygen in their incubators. This is a disease which is practically nonexistent now, and today with proper care premature babies can be expected to see their fathers and mothers.

Well, as I say, this is how you have to think of money. You have to consider it not in terms of auditors, not in terms of columns of figures, not in terms of the Bureau of the Budget, you have to think of it in actual translatable terms—again, people.

PROGRESSIVE COST OF RESEARCH

Next is the cost of research. Again going back, I can remember when a doctor had a stethoscope, a thermometer and a little rubber hammer, and he was in business. We did not even have tongue depressors. We had to use a spoon. Now I have to have many instruments and know how to use them. I have to have an electrocardiogram machine. When I was a medical student the electrocardiogram machine was half of the size of this room, and we had to hook up people across the street and have hand signals, like the Navy, to get the tracings made. Today, every doctor has a little box, which he carries around with him, and takes his electrocardiogram at the bedside and it is printed right away. You can see it.

Nowadays we have to have many, many different items which we never had before. We are even using an instrument for the early diagnosis of glaucoma. I can remember when many doctors had their own little laboratories, and they did pretty good work in them. They could do a blood sugar, or a blood count, and so on. Today, for an individual in the practice of medicine to have his own laboratory is nonsense because the instruments he has to have are way beyond the capacity of a doctor or a group of doctors to afford. They can't even take time out to learn how to use all those gadgets.

This is how you have to think of our problems in terms of money. We have items that use a $200,000 machine and 2 cents worth of paper to come out with an answer. These things, however, are needed, they are essential and they are expensive. But they have to be available.

TREATMENT OF DISSIMILAR DISEASES

Now I want to return to the Institute of Neurological Diseases and Blindness. Here you have a very unique Institute, because it is crowded with a whole group of dissimilar disease entities, most of which present unsolved problems of causation, etiology, pathology, and certainly treatment. Neurology used to be defined as a science in which you could identify a disease, but do nothing about it. Let us look at some of these diseases, such as multiple sclerosis, the so-called Lou Gehrig disease, the progressively degenerating diseases of the nervous system, strokes, injury to the nervous system, even headaches, brain tumors, chord tumors. This represents a field of research as vast as it is urgent. A major difficulty is that these diseases for the most part cannot be duplicated in the laboratory. We cannot produce multiple sclerosis or Parkinson's disease in an animal, as you can produce malignant tumors in animals. This greatly complicates the problem.

The same is true in the ophthalmological fields, and in the fields of hearing and speech. Just imagine if the people in this room could not speak or could only speak incoherently, how useless and how impossible would be this meeting. And yet there are thousands of people in this country who cannot speak at all, or who cannot speak intelligibly.

These are some of the problems which fall within the purview of the Neurological Institute. There are gaps in our knowledge with respect to etiology, pathology, and therapy that are not nearly as great in any other field. Nowhere are new research needs and approaches more urgently needed. In spite of all of our work, it is still difficult to confirm an early diagnosis of multiple sclerosis.

NEUROLOGICAL DIAGNOSIS

I have a patient here in Washington, the wife of an admiral in the N vy, who for 13 years has been living a miserable life, hovering between a vacuum of neurological diagnoses. This lady has been through all sorts of hospitals and centers. She was finally admitted to the Clinical Center.

They were able, in 3 weeks, to tell her definitely that she did not have multiple sclerosis. The fact that she is neurologically sick is important, but the fact that the sword that was hanging over her head

of progressive multiple sclerosis was removed has changed the entire pattern of her existence.

Dr. Lyons very ably told us about the diseases of tissues which do not heal themselves. At the present time, if you cut or transect the spinal cord, that is a permanent injury; it never grows back; it never becomes functional. What does that mean? You can cut almost anywhere else in the body and you obtain healing or regeneration. But if a young lady happens to be in an automobile accident, or a young man, like Mr. Campanella, and the continuity of the spinal cord is destroyed, that person is paralyzed from then on for the rest of his life, because we have not yet found any way of inducing the cord to regenerate. What is even more horrible is that in many cases they live a life of utter seclusion because they have no control over their bladder or bowels. They can't go anywhere. They can't do anything. This is one of the problems studied by the Neurological Institute.

SIGHT SAVING IN CHILDREN

Now let us think about some of the other problems tackled by the National Institute of Neurological Diseases and Blindness. Let us think about conditions of the eyes, exclusive of retrolental fibroplasia which we discussed a few minutes ago. Today, with combined therapy and X-ray treatment it is not only possible to save the lives of young children affected with retinal blastoma, which is a type of cancer, but also to save their sight.

The removal of cataracts has, in the past, required absolute immobility of the patient's head for several days after the operation and, in some of the older people, such absolute immobility has produced a secondary pneumonia. Well, we don't have to do that any more. Through the use of an enzyme and improved surgical techniques, the patient can now get off the table and walk right back to his room. People who are blinded because of injuries to the cornea are no longer blind, or they don't have to be. Corneal transplants have become a routine operation and eye banks are used.

GLAUCOMA INCREASE

Glaucoma is a disease which has received much more interest in the past few years than ever before. It seems that it is increasing, perhaps only because more people are living into the older age group. It is a disease which destroys sight. It makes people blind and sometimes very quickly. Here again research is desperately needed, first of all, to make the diagnosis. That is why, after all these years, I am learning how to use a tonometer, a machine that measures the pressure in the eyeball. A very important program has now been initiated within the Institute for a 5-year cooperative study to evaluate screening methods for the diagnosis of glaucoma.

DETACHMENT OF RETINA

Detachment of the retina was another horrible disease. You can have a perfectly good lens, but if the retina is pulled off at the back of the eyeball, you cannot see. The techniques of gluing the retina back and making it work represent a very difficult type of surgery Today, as a result of research, it has been found possible to focus an

intense beam of light onto that detached retina, and it is just like a welding machine. It welds the retina back into place, and vision is restored.

I could go on to recount many other marvels and tell you about what has been done and what is being done now and what are the hopes for the future, but the moral of my story was well expressed by Senator Byrd this morning. We are living in the world at a time when things are moving very fast. It is quite possible that you will vote $7 million for project A, and 6 months from now that problem will be answered. You would not ever have to spend that $7 million again because you would have obtained an answer. But, by the same token, if we don't find the answer to that problem, we might at the end of 6 months or a year have 10 more leads which would multiply the need for money many times in order to follow those leads to their ultimate end.

It has been a great privilege for me to be here. It has been a great privilege for me to serve on this Committee. But one thing I must leave with you: Remember the year 2000 and set your sights high, and we shall have no problem. Thank you.

Senator HILL. Are there any questions?

Senator STENNIS. I don't believe he has left anything to be said.

Senator BIBLE. My only comment would be, Mr. Chairman, that if the good doctor had remained in that bass fiddle position of the orchestra and continued as a musician, instead of becoming the able doctor he is now, I am sure he would have been the leader of the orchestra. It has been a fine presentation.

Senator HILL. He certainly gave a fine presentation. It was very, very fine.

Well, everybody will now understand this little story. When I was in New York last fall I remembered that many, many years ago the late Dr. Charles Mayo had told me that every person, after he got to be 40 years of age, ought to have a general checkup. I realized when I was in New York that I was 40 years old so I said, "Who is the best doctor in this city of New York? I will check with him." There is my doctor right there. That was a very fine statement, Doctor, very fine.

Dr. Wilson.

Dr. WILSON. Dr. Traeger began by citing his experience as a musician. I was a musician in a band when I was young, too. My job as a small boy was to help carry the base drum, and my feeling right now is that I am still in that role. I admire your fortitude, Senator. This committee has been running this race all day in relays, and the reporters, I notice, run it in relays, but you have been here all day. I sympathize with you.

Senator HILL. You have been here all day.

Dr. WILSON. But I have not talked all day.

PERINATAL PROGRAM OF THE NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS

My interest in the National Institute of Neurological Diseases and Blindness is quite different from that of Dr. Traeger. I would not say I have no clinical interests in it. I have no experience in the clinical areas. My interests in it are as a basic scientist who has had some interest in neurology and in reproductive physiology and in

human genetics. My association with this Institute is much more recent than Dr. Traeger's, too. It has to do with one of the most spectacular research programs that the NIH has launched, the perinatal program.

Several members of the committee have warned me not to go at length into this program and its ramifications because of my enthusiasm for it. Although this I would very much like to do. But at this late hour, I certainly am not going to do it. This is a program which is unique in many ways, and it consumes a considerable amount of the money that is appropriated to this Institute. This is the collaborative program in perinatal diseases, particularly those that have to do with the problem that is now known as pregnancy wastage. Every child has the right to be well born. The fact is that out of some 4,200,000 children born in a year, 126,000 are damaged in some way so that they are mentally retarded. As Dr. Traeger said, they will never recover from that. Injury to the central nervous system is not repaired. That means that 3 percent of the children born are destined to lead lives that make them dependent. The cost of this kind of damage in our society is enormous, not only in terms of the money required to support these children and the money that is spent in rehabilitation to make them as useful as possible, but even more in terms of the tragic consequences that occur when one of these children is born into a family.

PREGNANCY WASTAGE

The question of pregnancy wastage extends beyond this, of course, because while we are only talking here about the children who are born alive, there are the others that die before they are born. We have a magnificant lying-in hospital in Providence in which occur 8,000 births a year, with an enviable record in maternal health. They have not lost a mother in that hospital now for I think about 4 or 5 years. They never brag, however, about the children. They do bring magnificent children into the world, of course. But the number that are lost is too large and constitutes pregnancy wastage. They are the children that are not produced, that should have been produced, or that are produced damaged.

I am not going to attempt an elaborate description of this program, but wish to emphasize that it is an attempt to study a scientific problem which cannot be done by any individual. The nature of the problem makes it necessary to study a large number of births. The objective here is to study completely 40,000 mothers. If we were to do the same thing with mice or rats, it would be easy. There is a program at Oak Ridge where they are studying the effect of radiation on mice. I don't know how many million mice have been used in that. In this program it has been calculated that 40,000 births is the minimum number that can be used. In order to study this many, it has been necessary to set up a kind of research program which has never been attempted before in medicine, as far as I know. Fifteen institutions are involved in it, together with a large intramural program in the National Institute. This involves not only an interinstitutional program, but an interdisciplinary one. It involves not only obstetricians and pediatricians, but epidemiologists, psycholo-

gists, geneticists, statisticians, and others. It is a group of scientists who, for the most part, have never talked to each other before.

These men in the last 2 years, have been through the process of learning each other's language, and learning to understand what the other fellow talks about. This is the reason for my enthusiasm about it. It is an adventure, a new adventure, in scientific research and it is an enormously expensive one.

This accounts for a part of the increase that we are recommending over the current budget. In my own opinion, it is not enough. That is the reason I am on the program here.

NEW BUILDING NEEDS

In connection with that, I would like to speak to two things. One is the question of buildings, which Mr. Jones has already mentioned. It is almost imperative, it seems to me, that this Institute together with the Institute for Mental Health, be provided with a building. The National Institute of Neurological Diseases and Blindness has four components: one in the clinical center, where the basic clinical research is carried on, one in building 8 where it has a group of activities which involve research on large animals, a third in the old temporary building (T–6) which is the center of its extramural program, and a fourth, the center for this perinatal collaborative study that I am talking about in the Robin Building in Silver Spring.

The handicaps under which the Institute is laboring in being distributed in four buildings as far apart as these represent an unreasonable burden and interfere with efficient and effective operation.

MONKEY COLONIES

The other subject on which I particularly wish to comment is a project in Puerto Rico for the development and maintenance of monkey colonies which I presume you have heard about. The importance of this project is great. As Dr. Traeger said, it is impossible to produce many of the neurological diseases in the usual laboratory animals. The monkey is a little different, and many conditions can be produced in monkeys that are very similar to those in man. In Puerto Rico, we have a colony of monkeys on an island where every monkey is known, its history, its age, its name, and what has happened to it. It is very different from the monkeys we have had to use in the laboratory which are imported from Asia by airplane and often come to us sick We don't know what diseases they have had or how old they are, we know almost nothing about them, and this is not a good kind of animal to use in research.

I would like to cite one simple experimental result which has been obtained in Puerto Rico which will illustrate the importance of this colony.

PLACENTA TRANSPORTATION

A professor from Oxford had been studying for a long time the transportation of materials across the placenta, from the mother to the embryo. One of the important things that is carried across is oxygen. It is absolutely essential for the proper development of an embryo of any type of animal to have an effective, adequate supply of oxygen. The professor had done a lot of work on sheep in England,

and the question was whether or not his findings were valid for other species including man. He went to the monkey colony in Puerto Rico and there carried out some almost unbelievable experiments. He was able to corroborate what he had done before and make it useful to man.

Dr. Windle of the Neurological Diseases and Blindness Institute is doing effective work there in the experimental approach to cerebral palsy. The important thing is that they need more animals there. This is not an expensive project as far as the value of it is concerned. They need four additional islands on which they can establish four new colonies.

The Commonwealth of Puerto Rico owns the islands and we can get them free. All we have to do is to set up the program.

The other thing they need is an addition to the buildings which they hope to develop not only for our own use, but as a real international center. It would be where scientists could come to work and do the sort of research that Dr. Windle is doing there now.

These are some of the things that represent my interest in the National Institute of Neurological Diseases and Blindness and which have led the committee to recommend a major increase above the current budget.

Thank you.

Senator HILL. But they are all important things, Doctor.

Dr. WILSON. I think they are all most essential.

Senator HILL. You have certainly made out a strong case for them.

Are there any questions, gentlemen? If not, Doctor, we certainly thank you very much.

Now, Mr. Jones, the hour grows a little late. Dr. Wilson commented on the fact that I had sat here all day, but you folks have been staying there all day. Would you like to go on to another witness this afternoon?

Mr. JONES. We are at your pleasure.

Senator HILL. I believe the program calls for some testimony on the research construction program. Dr. Wilson, do you want to address yourself to that?

RESEARCH FACILITIES CONSTRUCTION PROGRAM

Dr. WILSON. I have been associated with this program since it was initiated and, in my own experience, this is one of the most inspiring and one of the most important jobs I have ever undertaken. The National Advisory Council on Health Research Facilities that administers these funds, or participates in the administration of them, is made up of a group of hardworking people. At least two people on the Council have visited each project that has come in. There have been over 800 of them. We have been, I believe, in every important health research center in America. When I joined the Council, the first authorization was $90 million for 3 years, and I thought it was a lot of money. In fact, I still think it is a lot of money. But to our great surprise, we could have spent the whole of that $90 million in the city of New York, and spent it fairly. We could have spent the whole of it in the State of California. We have practically rebuilt the research facilities in Boston.

To my great amazement, even such a distinguished institution as Harvard Medical School with its marble halls is obsolete. It was

built in 1906. The amount of money that is going to be required to put these buildings into condition to serve as modern laboratories is a sum that is almost incredible.

When I went into this program, some of my distinguished friends said, "Oh, another giveaway program." I would like to emphasize the fact that the sums of money being distributed in this program do not represent gifts. They are not gifts in the same sense that the old institutions used to go out and solicit gifts.

MATCHING FUNDS ON 50–50 BASIS

Senator HILL. As you know, Doctor, under the act which we passed providing Federal aid for these research facilities, there is a requirement for 50–50 matching, that is, the Federal Government puts up 50 percent and the recipient puts up the other 50 percent. Instead of it being a 50–50 proposition, the last figures I saw had it running about 4 to 1 from the standpoint of the non-Federal contributions. Isn't that correct?

Dr. WILSON. That is right. Thank you for the respite.

As I say, this bill was extended for another 3 years at $30 million a year, and it would seem that that would be a lot. Actually, the council has already approved applications that would consume the complete $30 million which will be appropriated next year, if $30 million is appropriated. We already have applications and firm declarations of intent that would exceed this to the point that would make any reasonable addition seem incredible.

The main point that I would like to convey is that at this session of the Congress it seems to me almost imperative that legislation be initiated that will continue the program for at least another 5 years beyond its present expiration date. I personally would like to see this program become an open ended one, to be continued as long as there is a real and demonstrable need. Moreover, I would like to see the annual appropriation at a somewhat higher level than before—$50 million a year.

FRUSTRATION OF LACK OF FUNDS

I would say, Senator Hill, that this has been an inspiring council to serve on, but a frustrating one. I know of no greater disappointment than to have visited an institution that really needs new facilities and needs them badly, and to get through a council meeting and find that the council does not have enough money to give that institution what it needs. Somebody then has to report to them that they are not going to get all that they need, and a readjustment has to be made.

This need is real. We have been in places where I have seen research in progress in old buildings that were never designed for laboratories. In Georgia, the oldest building on the campus at Athens is being used as a pharmacy school, and there are none of the usual facilities in it that an ordinary laboratory scientist would find it essential to use.

I have seen converted garages, barns, even a henhouse. There was a group of people working in a building in San Antonio that was a henhouse, and I think it is a hazard for a scientist to work in a building like that. We have been in hospitals where doctors have been working in former coalbins which have been converted to laboratories. Such conditions represent a great handicap to the scientist.

It is all right to say that a scientist can work effectively in those places, and perhaps he can, but not with the efficiency that he has the right to expect and which he will manifest if he has an excellent laboratory to work in.

FACULTY SALARY NEEDS

There is one other point, Senator Hill. You mentioned the 50–50 matching. This is another frustrating point. We have been in many institutions where they need not only research buildings, but pretty nearly everything else. Their plants are inadequate for all the things they are trying to do. The salary scale for the faculty is too little, and they need so much money that for them to take advantage of our program and make a sacrifice of other urgent needs just in order to get this 50 percent matching, seems to me an unfortunate circumstance. That is the way it appears to the council, and I am sure to your subcommittee here. We don't know exactly how to solve the problem because to depart from the 50–50 matching basis would result in a great many administrative difficulties. I am sure they can be solved. I would like to see your subcommittee challenged with the necessity of solving them. I am aware, as all members of the council are, of many places around the country that are not even putting in applications because they do not have any way of foreseeing where the 50 percent matching will come from, but they need the buildings just as badly as the big centers which are able, somehow or other, to find the money. The committee of consultants has therefore recommended that "in situations in which there is a clear and urgent justification for the construction of health research facilities for which full matching funds cannot be obtained, consideration should be given to modification of the matching requirement" as considered necessary by the National Advisory Council on Health Research Facilities.

I shall not say any more about this, because I am sure you are all aware of the program, and of its importance. I am sure that every Senator has buildings in his State of which he is proud and to the construction of which this program has contributed. I will repeat, though, that to my way of thinking this has been one of the most worthwhile jobs with which I have ever been associated, and I think you in the legislature are to be commended for having assured the financing of this program.

Mrs. BURNHAM. Mr. Chairman and Senators, I can add very little to Dr. Wilson's statement. Needless to say, I am in entire agreement with it. I am new at this job, having only been appointed as a consultant to the National Advisory Council on Health Research Facilities in February. But since that time I have made 15 project site visits and already I can get the feel of what this program has created in the institutions that I have visited. This is a most thrilling thing, to be able to walk through these buildings that never existed before. They would not exist today if it were not for this act which you passed.

CONDITIONS DEPLORABLE

Aside from that, there are the places referred to by Dr. Wilson. Scientists are working under deplorable conditions. The saturation point has not nearly been reached. I can only end up by saying that we hope you will endorse the recommendations of our Committee in this

area, which are, namely, (1) the extension of the authorization of the act to at least 5 years beyond its present expiration date in 1961 and an increase in the level of appropriation to $50 million per year; (2) a modification of the matching requirement in exceptional circumstances, and (3) the inclusion of multipurpose facilities for research, research training, and health education when the educational activities are closely related to the research program.

An amendment of the act will be necessary to include multipurpose facilities for research, research training, and health education. We find them extremely difficult to separate, in fact, one cannot do this.

Senator HILL. Thank you, Mrs. Burnham.

This is a matter that our legislative committee certainly must consider. I hope that you ladies and gentlemen of the committee will continue to give your thought to this matter of flexibility in meeting the situation that you have so well raised today, rather than just having a flat 50–50 requirement. You, as members of the council, would know whether there are cases which should have a larger Federal contribution, and we hope you can help us determine how we can work that out so as to assure justice and equity, and at the same time not open the door too wide.

I am sure our legislative committee will give this matter its very careful consideration. It would be wise for you to come down and give us your best advice. We certainly appreciate your statements here this afternoon.

Are there any questions?

Senator STENNIS. Mr. Chairman, I would like to say that due to commitments tomorrow before the full committee, of a subcommittee of which I am a member, I will not get here in the morning all the time, but while there is a chance I want to say that in all of my years here, I am satisfied, the entire day considered, this has been the best presented program, the most convincing testimony, and the most intelligently presented, and in a very fine spirit, that I have ever heard. I think this country owes these ladies and gentlemen a special debt that they will realize over the years. Thomas Jefferson once said in substance that the country will be all right as long as truth is free to combat error.

HILL-BURTON HOSPITAL PROGRAM

You have certainly had truth here today combatting some errors that have been floating around. I think it has been wonderful. The one item that has not been emphasized today in detail is the Hill-Burton hospital program, as we know it, which has been the great medium, after all, and has brought your knowledge and your research and medical science to the little people. I mention that as a tribute to our wonderful chairman as well as those of you that have helped in this program.

I am on the Armed Services Committee, as Senator Hill said. We are overwhelmed there all the time with matters of space, rockets, missiles and everything else, all in the military program, and which has its place. But it does not bring any solution. It brings protection but not solution. I am mighty proud to have been here today and feel much better about the situation.

Mr. JONES. For the committee, Senator Stennis, I would like to express our appreciation for those very, very fine comments that you have made. I am sure we all are grateful to you.

Senator BIBLE. Mr. Chairman, I simply want to associate myself as a westerner with the fine sentiments expressed by one southerner to another southerner. This has been an outstanding day. My only regret is that every single solitary member of the U.S. Senate has not been able to participate in this presentation today. It is truly outstanding. I simply want to close. We have eminent men here on the heart, cancer, neurology, sight, hearing, but I think we have as chairman of the subcommittee the ablest doctor of them all, Dr. Lister Hill. If this patient can't survive, it won't be Dr. Hill's fault.

Senator HILL. May I express my very deep appreciation to my two colleagues on the committee for their most generous work. We certainly appreciate them.

I said a while ago that I had found one time I was 40 years old. In spite of that fact, I have been in the Congress for a good deal longer time, I think, than either one of my two colleagues, and yet I want to confirm all that Senator Stennis says about this hearing today. I have never heard testimony more impressive, testimony that carried more the conviction of truth, that was so fortified and strengthened by the facts, so compelling, as the testimony we have had here today. Certainly I want to congratulate each of you, thank each of you, for the magnificent presentations made here today.

COMMITTEE RECESS

We will now stand in recess until 10 o'clock in the morning.

(Whereupon at 5:38 p.m., Thursday, May 19, 1960, a recess was taken until Friday, May 20, 1960, at 10 a.m.)

LABOR—HEALTH, EDUCATION, AND WELFARE APPROPRIATIONS FOR 1961

FRIDAY, MAY 20, 1960

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to recess, in room 1318, New Senate Office Building, Hon. Lister Hill (chairman of the subcommittee) presiding.

Present: Senators Hill, Chavez, Stennis, Monroney, Bible, and Smith.

COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

STATEMENTS OF BOISFEUILLET JONES, CHAIRMAN, VICE PRESIDENT, AND ADMINISTRATOR OF HEALTH SERVICES, EMORY UNIVERSITY, ATLANTA, GA.; ALFRED BLALOCK, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, JOHNS HOPKINS UNIVERSITY MEDICAL SCHOOL, BALTIMORE, MD.; VIRGINIA G. S. BURNHAM, VICE PRESIDENT, CONNECTICUT MANUFACTURING CO., INC., GREENWICH, CONN.; MICHAEL E. DE BAKEY, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF SURGERY, BAYLOR UNIVERSITY COLLEGE OF MEDICINE, HOUSTON, TEX.; EDWARD DEMPSEY, Ph. D., DEAN, WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.; SIDNEY FARBER, M.D., PROFESSOR OF PATHOLOGY, HARVARD MEDICAL SCHOOL, AT THE CHILDREN'S HOSPITAL, DIRECTOR OF RESEARCH, CHILDREN'S CANCER RESEARCH FOUNDATION, BOSTON, MASS.; HARRY LYONS, D.D.S., DEAN, SCHOOL OF DENTISTRY, MEDICAL COLLEGE OF VIRGINIA, RICHMOND, VA.; LEO RIGLER, M.D., VISITING PROFESSOR OF RADIOLOGY, UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL AT LOS ANGELES, EXECUTIVE DIRECTOR, CEDARS OF LEBANON HOSPITAL, LOS ANGELES, CALIF.; DAVID SARNOFF, BRIGADIER GENERAL (USAR), CHAIRMAN OF THE BOARD, RADIO CORP. OF AMERICA, NEW YORK, N.Y.; CORNELIUS H. TRAEGER, M.D., PROFESSOR OF CLINICAL MEDICINE, CORNELL UNIVERSITY MEDICAL SCHOOL, NEW YORK, N.Y.; J. WALTER WILSON, Ph. D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF BIOLOGY, BROWN UNIVERSITY, PROVIDENCE, R.I.; CECIL WITTSON, M.D., PROFESSOR AND CHAIRMAN, DEPARTMENT OF NEUROLOGY AND PSYCHIATRY, UNIVERSITY OF NEBRASKA SCHOOL OF MEDICINE, OMAHA, NEBR.; MARGARET H. SLOAN, M.D., STAFF DIRECTOR; MRS. BERNICE STORRER, STAFF ASSISTANT; AND MRS. CECIL M. WOOTON, EXECUTIVE SECRETARY

GENERAL MEDICAL SCIENCES

Senator HILL. The subcommittee will kindly come to order.

Mr. Jones, we welcome you and the members of your committee back with us this morning. We are happy to have you here, and will be delighted now to have you proceed in your own way.

Mr. JONES. Thank you, sir.

First, Mr. Chairman, I would like to express the appreciation of the committee of consultants to your subcommittee for the very patient hearing which your committee gave to this group yesterday. If it is in order, sir, we will proceed.

Senator HILL. Fine.

Mr. JONES. The first topic for this morning has to do with the activities of the Division of General Medical Sciences of the National Institutes of Health. We are going to start with Dr. Dempsey, Dean of the Washington University School of Medicine in St. Louis, who will present this topic.

Senator HILL. All right, Doctor.

Dr. DEMPSEY. Senator Hill and members of the subcommittee, I have prepared a statement which, with your permission, I would like to file for the record.

Senator HILL. If you wish, we will put your statement in full in the record and then have you make any comment that you see fit.

Mr. DEMPSEY. Thank you.

(The statement referred to follows:)

STATEMENT BY DR. EDWARD W. DEMPSEY, PROFESSOR OF ANATOMY AND DEAN, WASHINGTON UNIVERSITY MEDICAL SCHOOL, ST. LOUIS, MO.; AND MEMBER, COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH TO THE SENATE APPROPRIATION SUBCOMMITTEE ON LABOR AND HEALTH, EDUCATION, AND WELFARE ON APPROPRIATIONS FOR THE DIVISION OF GENERAL MEDICAL SCIENCES

THE DIVISION OF GENERAL MEDICAL SCIENCES, NATIONAL INSTITUTES OF HEALTH

The creation of the Division of General Medical Sciences, 2 years ago, was designed to meet several extremely important needs in the structure of the extramural programs of the National Institutes of Health. Briefly, these needs were as follows:

1. To provide support for fundamental biomedical research, i.e., research primarily directed toward elucidation of the structure and functioning of living systems and their reaction to the environment, in contrast to research expressly directed toward understanding or therapy of a specific disorder or related group of disorders.

2. To insure a supply, commensurate with our national requirements, of biomedical scientists adequately trained in the disciplines and techniques of modern biological and medical research.

3. To insure grants for research not adequately supported through the extramural programs of the categorical disease Institutes, but directed toward the elucidation of large problems of human biology or disease, e.g., aging, tissue transplantation, genetic disorders, environmental health, accident prevention, problems of nursing, etc.

In its second year of full activity, the various programs of the Division were supported by the Congress in the total amount of $45 million. Yet, so great was the need for support of such programs that the Division enters fiscal year 1961 with a backlog of scientifically approved but unpaid requests of the order of $17 million, quite apart from any new requests and applications which may be received during fiscal year 1961. Considering that this approved backlog represents individual grants, each reviewed and recommended by a group of experts, we believe that the backlog figure constitutes the single best possible appraisal of the current needs for both the research and training programs. Testimony before our Committee of Consultants, by the staff of the Division and by others who have been remarkedly accurate in such predictions in the past, provided solid

estimates that during fiscal year 1961 an additional $28 million in applications will receive scientific approval by the reviewing study sections, training committees, et cetera. Thus, adequate support of the programs of this Division for fiscal year 1961 would require an appropriation of $96,100,000 for these functions plus $1,670,000 for review and approval costs incident to administering these research and training programs of the Division. The total appropriation need, therefore, is at least $97,770,000. This sum is double that requested for fiscal year 1960 and there are compelling reasons why an appropriation of this magnitude should be made.

Research grants

There is general understanding of the difference between fundamental and applied research or development when these terms are employed with reference to physical systems. Thus, there is public awareness of the fact that research conducted by nuclear physicists provided the information which made possible the enormously more expensive task of developing nuclear weapons and reactors for the production of domestic power. Studies of the piezo-electric properties of crystals in university and industrial laboratories provided the information necessary for experimental development of transistors and "molecular electronics" on an experimental basis. This, in turn, led to the more expensive task of developing the miniature electronic systems now used in computers, guidance systems, et cetera. Again, the explorations of new classes of molecules by academic organic chemists provided the information which made possible the development of synthetic fibers such as nylon. The list of such instances is lengthy indeed and their sum represents the technological revolution which has so dramatically changed the world in which we live and whose impact we have as yet scarcely begun to appreciate.

That this same relationship obtains with equal force in medicine has not been as generally understood. But it is none the less true that the history of success in medicine parallels the history of success in physics, chemistry, and engineering. Each medical triumph has been based on seemingly recondite research done in an earlier time and seldom with any appreciation of the fact that the information being gathered might one day permit prevention or cure of human disease. A few illustrations will suffice to describe this relationship. From the medical standpoint, the years of effort to isolate and characterize viruses and to propagate them in the laboratory culminated in the applied research which made available vaccines for influenza and preventive immunization against poliomyelitis. The applied research which provided cortisone and related steroids was impossible until a host of investigators in a dozen nations had carefully documented the role of the adrenal gland in the life of the mammal, had isolated the hormones from this gland and characterized them chemically before attempting their synthesis. The virtual abolition of infectious diseases as a serious problem in our population rests on the research of such investigators as Flemming, Waksman, and DuBos who were intrigued with the biological implications of the fact that the metabolic products of certain micro-organisms suppress the life of other, competing micro-organisms. The remarkable technical achievements of modern surgery rest upon the foundations laid by those who have studied the minutiae of embryonic development, the dynamics of the circulation, the mechanism of operation of the kidney, the physiology of the gastrointestinal tract, the dynamic aspects of the circulation of the cerebral spinal fluid, the chemistry of the plasma proteins, the mechanisms for control of the serum electrolytes, et cetera. And again, the sum of these tales is the history of medical progress.

In recounting this history, however, the nature of scientific progress is frequently distorted, since such progress occurs by two procedures. On the one hand, there are the spectacular events, instances in which a particularly brilliant investigator opens a new vista of understanding or provides a powerful new tool or technique for the exploration of living things. These are the highlights which are dramatized in the usual history of medicine. But, in addition and quite as important, is the activity of larger numbers of investigators of lesser stature who fill in the smaller blanks in our understanding, who seize the opportunities created by their more distinguished colleagues, take advantage of the new tool or new approach and add to the body of knowledge in small discreet steps. But it must be understood that the next great leap in progress rarely occurs until a secure foundation has been laid by the combined efforts of this larger group. Accordingly, if progress is to be maintained, both classes of investigators must be supported, although the level of support should be commensurate with the nature and quality of their

research activities. It is precisely such research for whose support the Division of General Medical Sciences was brought into being.

The study sections and training committees of the National Institutes of Health have, if anything, been even more rigorous and critical of research grant applications in this area than they have been with regard to specifically disease oriented research. Yet, an additional appropriation of $14 million will be required in fiscal year 1961 if the backlog of scientifically approved but unpaid requests in fiscal year 1960 and the scientifically approved new requests expected during fiscal year 1961 are to be supported. When one considers the short period in which this program has been in existence it is apparent that there was an acute need for the creation of the Division of General Medical Sciences and immediate provision of support for fundamental biomedical research.

It is in order to ask at what financial level the research program of the Division should be established. But the only reply possible, in good conscience, might be considered an article of faith; namely, that "Medical research in these United States should be pursued with all the vigor and talent which can be brought to bear and that our goal is the maximum effort of excellent research compatible with our resources of manpower, facilities, and the national economy." This philosophy pertains more appropriately to the research programs of the Division, perhaps, than to those of the categorical Institutes since it is the research supported by the Division which must provide the fundamental information without which the categorical disease research programs cannot be expected to progress. As a nation, we must have learned by now that it is folly to support applied research development handsomely while paying only lip service to the support of fundamental research.

Particular attention should be drawn to one exciting new development initiated during fiscal year 1960 under the aegis of the Division. From the appropriations to the categorical disease Institutes there was pooled a fund of $3 million with which to support the creation of clinical research centers in a selected group of medical schools. This development was long overdue. For the first time, the faculty of these medical schools will have available to them the facilities necessary for truly professional quantitative clinical research. The availability of these facilities will markedly enhance the quality of the research already initiated in these institutions with NIH project research grant support. But it appears illogical to limit such facilities to those few institutions whose requests were granted in fiscal year 1960. If the concept is meritorious, as is universally agreed, then such facilities should be made available to every medical school-based research center whose research activities are on a sufficient scale to assure efficient utilization of such a specialized facility. The appropriation needed for research grants is in total $57 million of which $17 million will support the establishment of centralized clinical research facilities and $40 million will be needed for the regular research grant program. These sums include indirect costs allowances of up to 25 percent.

Research training grants

Until recently, the continued growth of the National Institutes of Health supported medical research was sustained largely by the corps of investigators who had been trained in the conventional manner prior to 1950. The useful research working force had been augmented by the fellowship program at the National Institutes of Health and by the categorical disease Institutes, programs of training grants. But none of these permit our medical and graduate schools to expand and improve the training of biomedical scientists in the basic medical sciences. For some years it had become apparent that the pool of adequately trained research manpower effects a sharp restriction on the total national effort in biomedical research. It must be emphasized that such research is conducted, in the main, by those who constitute the faculties of our medical and related graduate schools. Although perhaps insufficiently documented at the time of the creation of the Division, it was generally appreciated that this pool of research manpower would also shortly be the limiting factor in expanding the teaching activities of existing medical schools and in creating new medical schools to meet the demands for medical care of our rapidly increasing population. In the interim, since creation of the Division, this problem has been more adequately documented in the Bayne-Jones report, in the Bane report, and is summarized in the report of the Committee of Consultants on Medical Research. It is all too clear that if our national medical research effort is to be expanded, if our output of well trained physicians is to be increased, then drastic steps must be taken first to insure the provision of an adequate national supply of well trained biomedical scientists. It was to this end that the training grants program of the Division of General

Medical Sciences was instituted. If the projected rate of growth of this program can be maintained, it will be barely possible to provide investigators and teachers of the basic medical sciences at a rate commensurate with the national requirements. In considering the level of financial support of this activity it is important to recognize that, even were the supply of teacher-investigators from existing programs in universities numerically adequate to meet the demand of the future, which is not the case, unless funds were provided which would make possible drastic improvements in the quality of such training, the graduates of existing training programs would have been inadequate for our times.

In retrospect, one of the most remarkable intellectual achievements of the last 20 years has been the synthesis and merger of physics and chemistry; these have become one intellectual discipline and permit a unified concept of the physical universe. Still more remarkable is the fact that we are in the midst of yet another revolution in which the biological world is being viewed from the standpoint of physics and chemistry. It is apparent that, in the near future, there will have been attained a unified picture of both the biological and physical universe. And it is in this wondrous new understanding of man and the ailments to which he is subject that we place our hopes for future medical progress. Only with such understanding can we hope to relieve mankind of the dreadful burden of degenerative diseases, genetic disorders, cancer, and the many disturbances in mental health. But, by the same token, the training of scientists in this newer biology and medicine has become vastly more expensive than in the prewar era. The time required has been extended, the laboratory equipment has grown increasingly complex, the necessity for intensive participation in an apprenticeship relationship with a master investigator more imperative. But our medical and graduate schools cannot undertake this revolution in the training of medical scientists from their own resources and, accordingly, the institution of the research training grants program of the Division was thrice welcome. It is patently in the national interest to support such programs to the fullest extent to which our universities can efficiently utilize such funds. There can be no better investment in the future health of the American people.

In this regard attention should be called to two special programs operating under the Division. The experimental training grant program has been financed at the level of $500,000 per year for the past few years, thereby permitting the operation, in a selected group of medical schools, of experimental programs designed to interest talented young medical students in careers in research and to increase their sophistication as investigators. It is evident at this time that this experiment has been successful and there is no longer reason to continue in that status nor to restrict this opportunity to so limited a group of medical schools. The time is at hand when every medical school capable of operation of such a program, a judgment based on the level of research activity of its faculty, should have this opportunity made available to its students, and the operation now designated as the "Medical student research training program." In its stead, yet another experiment should be substituted. Our great universities have no monopoly on the supply of bright, young undergraduate college students. But, whereas in the universities, undergraduate students have frequent contact with the research efforts of the graduate and medical faculty, this is not the case in the liberal arts college. This is particularly unfortunate since career choices are generally made at this time. Accordingly, the Division, together with the National Advisory Health Council has contemplated an experiment which would permit inauguration of training programs in biomedical research in a select group of liberal arts colleges. Such a program would be truly experimental and studied with great care. But it is highly to be commended, since it will be fruitless to erect large research centers or finance research training programs if we cannot also elicit the interest of our talented youth in careers in biomedical research.

This highly important and significant grant program as a totality has demonstrated the need for at least $27 million allocated for the regular research training grant program in order to allow support in important areas of the biomedical sciences not yet included in it. In addition, at least $2,500,000 should be allocated for the establishment of the medical student research training program which has already demonstrated its value in experimental form; and finally, $500,000 should be allocated for experimental training programs in a small highly selected group of liberal arts colleges. The total appropriation for the research training programs of the Division, therefore, should be $30 million.

Research fellowships program

The fellowships program at the National Institutes of Health is one of the oldest and most successful of its activities. From it has begun to appear mature investigators who are finding their places on medical faculties and the faculties of

related graduate school departments. Little further need be said in support of this activity, a traditional and time-honored means for the care and feeding of the neophyte investigator. But particular attention should be paid to the requirements of the relatively new program of senior research fellowships. The financial resources of medical schools have been a serious handicap in the national medical research effort in that they have not permitted the growth of a junior faculty of superior research attainments. The senior research fellowships program has permitted the placement, on the preclinical faculties of the medical schools, of well-trained, eager, young investigators while giving the universities several years in which to arrange for the subsequent financing of the faculty positions thus created. This device has been extremely effective but the total level of support is inadequate even for the current national need, to say nothing of future requirements. The recipients of these fellowships are the most highly selected, talented, young investigators produced by our educational, training, and fellowship programs. This group fully warrants support and the program must be expanded in keeping with the national need. Moreover, as the problems of biology as they apply to medicine have become increasingly the subject of research by investigators in the graduate schools of universities, the latter have assumed an ever larger role in the total structure of biomedical research. Accordingly, it would appear fully warranted to utilize this same device for the strengthening of the research and training programs of such departments. It is warmly recommended that the senior research fellowships awards no longer be restricted to appointees in the preclinical departments of medical schools and that the program be expanded to include departments of biology, chemistry, physics, and biophysics in the graduate schools of universities which provide an appropriate intellectual and research milieu. With the recommended expansion of the senior research fellowship program described above, the total needs in this valuable program amount to at least $9,100,000 of which at least $4,500,000 should be allocated for the senior research fellowship program.

Status of the Division of General Medical Sciences

The Division was created as a device for the administration of the increased appropriations for the support of fundamental research and research training under the appropriation title "General research and services." But the diverse programs of the Division are of paramount importance to future progress in medicine. It is not extravagant to suggest that, from the long-range standpoint, the programs of the Division will have the greatest influence on the health of the American people of all the programs now in being at the National Institutes of Health. It seems fitting and appropriate, therefore, that the Division of General Medical Sciences soon be accorded a dignified status in keeping with its enormous significance. The Division should no longer be merely an administrative arrangement but, rather, should become a creature of the Congress, a full-fledged Institute among the other National Institutes of Health. Such an Institute need have no intramural research program at the time of its founding but administrative responsibility for the diverse programs now managed by the Division of General Medical Sciences. Perhaps in some future year, a laboratory for an intramural program may be deemed appropriate but it is not essential to the initial creation of the Institute. It is urged that the Congress consider, at this time, creation of a National Institute of General Medical Sciences.

Budget for the Division of General Medical Sciences

Appended hereto is a recommendation concerning the budget of this Division for fiscal year 1961. The effect of this suggestion would virtually to double the appropriation for the Division as compared with fiscal year 1960. This suggestion requires no apology. The budget here presented reflects the healthy growth, vigor, and vital significance of the programs of the Division which, it is to be noted, are the most recent of the extramural programs of the National Institutes of Health authorized by the Congress. The programs are designed to provide a sound underpinning for medical progress tomorrow by providing the necessary fundamental ideas, techniques, scientifically trained manpower and clinical research centers. They should provide the solid foundation on which can be built the activities of the categorical disease institutes while at the same time implementing a mounting scale of research on the tremendous problems of our aging population and environmental health. Unless such programs are adequately supported today, future appropriations for the categorical disease institutes, or for expansion of medical schools or for construction of new medical schools, will be vitiated. In this sense, comparison of the total budget of the Division with that of any other individual categorical research institute is irrelevant. If applied

research is to be supported tomorrow, it is essential that the fundamental research upon which it will rest be supported today. If new medical schools are to be created tomorrow, their faculties must be trained today. Our Nation should not be appalled at the increase in budget here proposed but, rather, rejoice that we possess the national resources to mount this program on the scale suggested since it is but preparatory to an all-out attack on disease in future years, an effort necessary to achieve some measure of control over the disorders which now ravage mankind.

This budget is the venture capital essential now in the development of needed medical research and training. As a fraction of the national economy the costs are small, albeit not trivial. Certainly, they are of such magnitude that no other agency or instrument of the American people than the Federal Government can possibly provide funds in the amounts required one day to achieve this most remarkable and desirable of man's aspirations; the eradiction of disease. The profits ultimately to be realized in human welfare and economic gain are of a staggering order and fully justify this investment. These budgetary needs of the Division are consolidated by separate major programs below.

Research grants, including clinical research facilities	[1] $57,000,000
Research training grants	30,000,000
Research fellowships	9,100,000
Review and approval costs (direct operations)	1,670,000
Total	97,770,000

[1] Indirect costs allowance of up to 25 percent has been included.

DIVISION OF BIOLOGICS STANDARDS (DIRECT OPERATIONS)

The Division of Biologics Standards conducts and administers the control program (including licensing, inspection, testing of products, and preparation and distribution of reference standards) in connection with the regulatory functions assigned under the biologic control provisions to the Public Health Service Act, and the research activities covering the investigative and developmental work essential to those control activities.

The activities of this Division serve to safeguard the health of the Nation and appropriations of at least $2,745,000 have been justified.

SUMMARY

Needed appropriations for the Division of General Medical Sciences and the Division of Biologics Standards under the appropriation title "General Research and Services, National Institutes of Health" of the Public Health Service are summarized below in the form adopted in the Federal budget for fiscal year 1961.

Grants (Division of General Medical Sciences):	
Research grants	$40,000,000
Clinical research centers	17,000,000
Subtotal	[1] 57,000,000
Research training grants	30,000,000
Research fellowships	9,100,000
Subtotal	39,000,000
Total	96,100,000
Direct operations:	
Division of Biologics Standards	2,745,000
Review and approval (Division of General Medical Sciences)	1,670,000
Subtotal	4,415,000
Total	100,515,000

[1] Indirect costs allowance of up to 25 percent has been included.

Basic Research

Senator Hill. Doctor, we will be delighted to have you proceed now, as you wish.

Dr. Dempsey. I wanted to speak briefly and with particular force on three topics which pertain to the Division of General Medical Sciences. These are: (1) consideration of fundamental, or basic research, as contrasted with the more specialized applied research, (2) the training programs of the National Institutes of Health, with special emphasis on those of the Division of General Medical Sciences, and (3) the recommendation which the Committee of Consultants on Medical Research wishes to make with respect to raising the Division to Institute status.

Now first, about fundamental research, which is peculiarly the function of the Division, I wanted to emphasize that there is frequently a misunderstanding as to what is meant by fundamental research. It ordinarily is suggested that fundamental research is activity without any practical role in science or for science. This, I think, is not entirely true. Fundamental research, as ordinarily defined in our medical research institutions, represents merely the most severe effort to understand the phenomena which are under study; then, understanding the phenomena, it is possible to entertain the question of applicability, although that is not the primary goal of research. Understanding is the primary goal, but applicability is far from being forgotten. There are very few people, I believe, who do not wish to see the results of their work applied to human welfare, and I am sure that most of our scientists who regard themselves as undertaking fundamental work, have very close to their desires the hope that direct benefits to mankind will result from their efforts.

Tissue Transplants

This is illustrated, I believe, by several of the programs which the Division of General Medical Sciences has undertaken. As examples of the kind of thing that I am talking about, I might mention efforts to understand the basic factors underlying tissue transplantation. These are the factors which cause organisms to reject foreign tissues. Obviously, the more that we can learn about the mechanisms which the body uses either to reject or not to reject a tissue grafted from another individual or another animal, the closer we will be to the applied goal of transplantation of organs or portions of organs as a means of repairing defects which have occurred.

A considerable amount of progress has already been made along these lines, for example in regard to corneal transplants mentioned yesterday which represent one of the major techniques for the cure of a particular kind of blindness. Skin transplantation and organ transplantation are now possible within certain narrow limitations.

Use of Electronmicroscopy

Another kind of example in which fundamental research has already paid dividends in the field of medicine derives from some of the newer methods of anatomical investigation.

Yesterday we heard that new tools, new instruments, which had been and are being introduced into medicine, offer great hope for the future, and the electronmicroscope was mentioned. This instrument

permits magnification 100 to 100,000 times greater than that previously possible with other ordinary microscopes. It is being applied now to the study of many tissues and organs in the body, amongst which are the nerve tissues.

EDEMA OF THE BRAIN

The brain and the spinal cord have been investigated by electron-microscopy and surprising discoveries have been made. Perhaps one of the most notable discoveries is that there are no tissue fluid spaces of any magnitude in the brain. This comes as a considerable surprise to the investigators who have known that the brain potentially has a considerable fluid content, and that this fluid content can be increased pathologically in cerebral edema which is a very dangerous condition, particularly in neurosurgery.

Senator HILL. Excuse me 1 minute, Doctor. You made a very interesting statement there about fluid in the brain, as I understand it, and how you can increase this fluid content; is that right?

Dr. DEMPSEY. Yes, sir.

Senator HILL. Now, give us a little picture of why you would want to increase it?

Dr. DEMPSEY. It is not so much that we want to increase it, as it is that we want to be able to control it. My neurosurgical friends are very concerned about edema, because in certain operations it kills people. If edema of the brain has occurred before the operation, or occurs at the time of operation, it is a very bad sign and the patient may die. The pathological accumulation of this fluid is something which we very much wish to be able to prevent. Formerly, we had thought this fluid was in the spaces between cells in the brain. We now know that it is actually within certain cells of the brain and that, therefore, the mechanisms necessary to control this abnormal accumulation of fluid must be different from those which are designed to dry up the fluid that is in the extra-cellular spaces.

In other words, this observation has provided information which may provide the means to control this pathological accumulation of intracellular fluid.

DISEASES OF NERVE SHEATHS

Another example of new, and to me extremely exciting, research done by electronmicroscopy involves the demyelinating diseases, those diseases of the nervous system in which the sheaths of nerves are destroyed and the nerves die as a consequence.

It is now known from electronmicroscopy that there are at least two kinds of demyelinating diseases, whereas formerly we lumped them all together as one.

In one kind the damage and injury is to the nerve cell itself and the sheath disappears secondarily as a result of this damage.

In the other kind the damage is to the cells which manufacture the sheaths, whereas the nerve cell itself is, for the moment, unharmed. This again directs attention to the fact that measures to prevent and treat these two kinds of demyelinating diseases will probably be different. Likewise, it will probably prove impossible to develop a single method for the treatment of all kinds of demyelination, because there are at least two targets we are trying to shoot with one rifle.

REGENERATION OF BRAIN AND CORD

Along this line, there are also suggestive and most interesting clues to indicate that regeneration of the brain and of the spinal cord may not be completely impossible, although it has seemed to be in the past.

Dr. Traeger mentioned yesterday that regeneration does not occur normally in the brain, and this is certainly true. Nevertheless, under some circumstances, beginning efforts on the part of nerve cells in the brain to regenerate have been observed and, under certain experimental circumstances, this regeneration can proceed to completeness; so there is great hope that enormous strides therapeutically may result from this increase in understanding that is derived from basic nerve research.

EARLIER LABORATORY CONDITIONS

My point in belaboring this explanation of fundamental research lies in the fact that in the past our laboratories have been ill equipped, and our scientists have therefore been limited in the amount and variety of work that they could do. In the past, a laboratory devoted to fundamental anatomy, which I represent, was regarded as reasonably well equipped if it had microscopes and a method of dissecting tissues, and that was about all. Consequently, if a discovery were made which, for the next stage of development, required a chemical technique or biophysical technique, this next step had to wait on the chance that some other investigator, perhaps in some other city, would read about, and become acquainted with, and interested in, this discovery. As a result, only rarely were rapid steps taken to pursue a clue which was already known.

MODERN LABORATORIES

Today—and this is largely through the efforts of the Division of General Medical Sciences—many of the laboratories devoted to fundamental medical research are equipped as multipurpose laboratories in which there are not only light microscopes, but also electron-microscopes, physico-chemical equipment and physiological apparatus, so that within a single locus, and in the hands of a single investigator or group, the problems may be pursued a great deal further and faster.

This has the result of vastly shortening the time between discovery and the development of the discovery to the point where it can be applied to clinical patients.

TRAINING PROGRAMS

Turning to the training programs of the Division, one can make, I believe, a somewhat similar case to the one I have attempted to make for fundamental research.

Senator Smith remarked yesterday that it would seem useless to devote large sums of money to research if the manpower were not trained to work in the laboratories and to utilize the equipment and the techniques. This is certainly true.

The training of these investigators is, however, a highly varied procedure. There are many kinds of training which are required. There is, first of all, the training necessary to equip an individual,

who has already been trained as a physician, with the knowledge and skill to use the special techniques and tools of the specialty subject. For example, a neurologist uses equipment designed to stimulate nerve tissue and to record electrical impulses of the tissue with a refinement not found anywhere else in medicine, so that the neurologist trained in the use of his particular kind of equipment gives a highly specialized performance. This can be done only by people who already have had a very considerable amount of general experimental training and who have a general understanding of the basic phenomena of their field.

TRAINING FOR GRADUATE PHYSICIANS

Here the Division of General Medical Sciences has made available training programs which are designed to train graduate physicians in the fields of neuroanatomy, neurophysiology, experimental cancer research, experimental heart disease, and so on, functions which complement the activities of the Institutes and in which the Institutes have rather a proper field of activity.

MEDICAL STUDENT TRAINING PROGRAM

The Institutes, however, also provide funds for the training of investigators who back up and underscore the efforts of clinically oriented investigators and support the personnel under which young men, as medical students, first become oriented toward research.

With your permission, I should like to tell a story of a particular young man who has been interested in research, to indicate how these programs operate and what their effect is.

A few years ago this young man came to our medical school and attracted the attention of his teachers in the first semester because he was an extremely bright and alert individual.

Upon talking to him, we discovered that he had no comprehension of medical research. He hardly knew that this was a proper field for a career in medicine. He had come to medical school only because of his understanding that medicine was a field in which one could serve humanity, and he understood the practice of medicine alone to be the way in which this could be done.

Through the experimental training grant program we were able to provide him with a summer fellowship whereby he worked for 3 months in one of the laboratories. He did this for the following summers that he was in medical school, a total of three summers.

During this total of 9 months that he spent on research, and for a total investment of $1,800, he produced four published papers during the time he was a medical student. These were excellent papers.

Following graduation from medical school, instead of going into clinical medicine as he had originally intended, he accepted an internship in pathology in one of our leading medical schools.

Following this, at present, he is in one of the Armed Forces serving his obligatory military service. He has been assigned to one of the military hospitals where he is carrying on an active research program, using electronmicroscopy, which has greatly vitalized the research program of that institution. He intends to return to academic medicine upon the completion of his military service.

Now this is a single case report out of many which could be cited that illustrates how effectively these programs have attracted the attention of young men and women and have directed them into research, and it shows how effective these programs can be.

In addition to the medical student training program just mentioned, which the committee has recommended should be continued and expanded, there are two other training programs carried out by the Division of General Medical Sciences which I should like to mention briefly.

SENIOR FELLOWSHIP PROGRAM

One is the senior fellowship program, which has proved very successful in attracting and holding young men in their professional careers at a very vital time. We believe, in our committee, that these senior fellowships should be expanded, particularly by making them available to young men in the clinical departments, as well as in the preclinical departments to which they are at present limited.

TRAINING FOR ADVANCED PERSONNEL

Then, finally, we should like to recommend a further extension of the training program to provide stable and special career opportunities for still more advanced individuals, while they are pursuing the ultimate stages of their training and participating in the training of other young men.

These programs of the Division of General Medical Sciences are quite familiar to me, since I have worked with them from their inception. It seems to me that they have been devised with great imagination, and their effectiveness in pursuing the objectives of the Division has been great.

The advantages shich have accrued to the institutions as a byproduct of these programs are also worthy of consideration—the availability of improved instrumentation and of a greater number of trained investigators have in turn greatly improved the quality of the research and of the training programs of the institutions which are carrying them out.

INSTITUTE STATUS RECOMMENDATION

It seems to our committee that the time has now come when the Division of General Medical Sciences should be given Institute status, and we are so recommending for the following reasons: (1) The Division must be able to secure adequate advice and support from its own council; (2) it requires Institute status for adequate recognition of its activities, and (3) it has reached such a size that Institute status is commensurate with the scope of its activities.

Senator HILL. Are there any questions?

Well, you certainly have brought home to us, Doctor, just how complex the human body is; is that not right, Doctor?

Dr. DEMPSEY. It is rather complex, yes.

Senator HILL. I am glad that we are getting these basic or fundamental research benefits.

Dr. DEMPSEY. Yes, sir; and these fundamental things are not so far removed from the direct benefits to patients as we are sometimes led to believe.

Senator HILL. We certainly very much appreciate your statement, Doctor.

TRAINEES PRESENT

Now may I say, members of the committee and our friends here this morning, that we are happy to have with us, attending this hearing, a group of trainees from the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center. These trainees who are here, many of whom have brought their wives, will become doctors. They have come from all over the world to study at the Institute; in fact, those that have come here this morning represent trainees from 23 different countries It might be interesting if I read the list of countries represented here:

Albania, Hungary, Brazil, China, Colombia, Egypt, Finland, France, Germany, Haiti, Iceland, Iran, Lebanon, Mexico, Nationalist China, Poland, Portugal, West Africa, Taiwan, one from the United States, Vietnam, and Yugoslavia. The reason I recited the one from the United States is that I wanted to show that all the other 22 came from these other countries, the names of which I just read.

Senator SMITH. Mr. Chairman, I think it would be nice if they would stand for us.

Senator HILL Would you all stand for us?

We feel this is a historic day, having our committee of consultants with us, and we are certainly delighted to have these trainees, and all of us know Dr Howard A. Rusk, who is the head of the New York University-Bellevue Medical Center Institute of Physical Medicine and Rehabilitation. We know what a world figure and servant to mankind he is, and we certainly enjoy having all of you here.

Now, Mr. Jones, who is your next witness, please, sir?

CANCER RESEARCH

Mr. JONES. Mr. Chairman, we turn now to the question of research in cancer, as carried out under the National Cancer Institute, and we have asked Dr. Farber to lead the discussion and Dr. Rigler to comment subsequently

Senator HILL. All right, Dr. Farber.

NATIONAL CANCER INSTITUTE

Dr. FARBER. Mr. Chairman and members of the subcommittee, it is my privilege to speak about the program of the National Cancer Institute on behalf of our committee.

RECOMMENDED INCREASE

The report of the committee of consultants includes a recommendation of an increase of over $16 million to cover the on-going programs of the National Cancer Institute and to permit also the really vast expansion which is necessary in several directions which promise to be of great practical importance.

PROGRAMS OF NATIONAL CANCER INSTITUTE

The program of the National Cancer Institute covers a wide range of projects concerning the nature of cancer and its causation, its bio-

logical behavior, the biochemistry of cancer, and the diagnostic and therapeutic aspects of this extremely important problem.

There are three major programs which have been brought into being by the action of the congressional Committees on Appropriations, and concerning these I have had the opportunity of speaking before this subcommittee in previous years, usually in the company of my distinguished colleague, Dr. Ravdin.

CHEMOTHERAPY

The first of these programs concerns the chemotherapy of cancer. It was in 1953 that, through the action of this Senate committee and your counterpart in the House, a special appropriation was made to develop as rapidly as possible the important leads which had come from a number of research laboratories and institutions concerning the reaction of chemical compounds on cancer, including leukemia.

The dream of centuries of a chemical treatment for cancer has been brought into reality within the last 15 years, beginning with a brilliant discovery by Dr. Charles Huggins that the female sex hormone could control for a period of years and actually destroy temporarily cancer of the prostate. The research of many people brought forth the evidence that cancer of the breast in women could be controlled, for a time, even when it had spread to other organs, by the use of male sex hormones. In 1947, the first chemical to give some measure of control of acute leukemia in children was discovered.

This was the beginning of what we call chemotherapy, a term which was used for the first time by Paul Ehrlich at the turn of the century when he was looking for chemicals which could destroy bacteria.

In the few years since the congressional appropriation permitted an earmarked program in this field, there has been a very rapid expansion of research on chemotherapy in many laboratories and hospitals throughout this country and in other parts of the world.

ACTIVITIES UNDER CHEMOTHERAPY PROGRAM

I would like to give you just a few figures today which I have obtained from my colleague, Dr. Stuart Sessoms, who is the Chief of the Cancer Chemotherapy National Service Center, which was set up through congressional action as the focal point of our national chemotherapy program.

Since 1953, over 100,000 agents have been studied for anticancer activity in experimental systems in the laboratory. Fifty-three thousand of these agents are antibiotic filtrates, and I might say a word about antibiotics at this time.

DEVELOPMENT OF ANTIBIOTICS

It was Dr. Selman Waksman who gave us streptomycin and coined the term "antibiotic." Since 1940, approximately 30 antibiotics have been discovered and have been proved active against disease in man. Three are produced by molds. One of those is penicillin and another, griseo fulvin, about which you have had recent reports, is the first agent truly effective against fungus infections of the skin. Three are produced by bacteria; one of these, polymyxin, is of great importance against bacterial infections. Twenty-four of the 30 are produced by

one family of organisms, the actinomyces, which produce the anti-cancer agent known as actinomycin. This family also produces streptomycin, aureomycin, and erythromycin. I mention this because here are agents produced by the great chemists of nature—bacteria, molds, and the small organisms in the actinomyces family. These tiny biological entities are able to produce chemical structures which are extremely difficult for even our brilliant chemists to characterize and make in the laboratory.

We can take advantage of what nature has performed here through the great knowledge of antibiotics that has come mainly from industry, and academic institutions leading to the purification of materials produced by these living agents. Our interest in the field of cancer in relation to antibiotics arises from the fact that we now have some of these products, the actinomycins particularly, used in man since 1954, which actually temporarily destroy some forms of cancer even after they are widespread in the body. These antibiotics, although still extremely toxic, offer one very important and promising direction in chemotherapy research today.

For that reason, at the present time great stress has been placed in the chemotherapy program on the production and study of these antibiotics. Most of these come from our colleagues in industry who are, with splendid cooperation, placing these filtrates at the disposition of the Chemotherapy Service Center. At the present time four of these new antibiotics are in clinical trial and two of these may be regarded as exceedingly promising.

CHEMICAL COMPOUNDS STUDIED

During the period of the chemotherapy program since 1954, there were 49,023 synthetic chemical compounds studied in this program. About 18,000 a year are now going through screening procedures. We have a great interest in the synthetic program. This is where the mind of man can be put to use and all of this basic research that Dr. Dempsey talked about comes into play. In the field of synthetics, we have three new structures, completely new and untried before on patients, which are now in clinical trial.

STEROIDS

There are some 800 steroids, materials which are similar in structure and in action to the sex hormones. Because of a special appropriation which you awarded 3 years ago for the study of steroids, the cancer endocrinology program was stimulated and greatly expanded. It has already been possible to study some 800 hormonelike chemicals in the screening systems. Clinical trials of 20 of these are nearing completion. Two of these are of great promise. One-half of the more than 115 chemical agents that we are now using for cancer in patients in collaborative studies, are steroids.

The national chemotherapy program is also studying extracts of natural materials, such as plants or flowers or trees. Of great interest is the discovery a few months ago that an extract of the periwinkle, something that we all know quite well, has an important temporary effect upon acute leukemia of certain kinds in man. It is capable of destroying temporarily tumors such as choriocarcinoma when other agents fail, as shown in the National Cancer Institute this past year,

and it is now being studied as intensively as possible to see how many different kinds of cancer in man may be affected by it.

COMBINATION OF METHODS OF TREATMENT

There are at the present time at least 30 chemical agents which are in daily use throughout the hospitals of the country as part of the total care of the patient with cancer, often in combination with surgery or with radiotherapy, and particularly in use against those forms of cancer which are beyond the reach of surgery and radiotherapy. The combination of chemotherapy with these other methods of treatment has been responsible in the last 5 years alone for an important reduction in deaths from cancer. We are no longer talking about theory. We are talking about fact. We have chemical agents which can, at least temporarily, destroy many different forms of cancer in the human being.

I refer particularly to acute leukemia and chronic leukemia and I refer also to patients with cancer of the breast, the prostate, the ovary, and certain forms of cancer of the uterus. I refer to cancers which are widespread from the original source in the intestine, tumors which we could never control once the tumor spread beyond the reach of surgery. Because of the discovery 2 years ago at the University of Wisconsin by Dr. Heidelberger of 5-fluoro-uracil and related compounds, Dr. Curreri was able to show that these new chemicals can now control about 50 percent of tumors of the intestines which have spread beyond the original site for at least a period of a year. This is only one of a growing number of illustrations of this kind.

CHEMOTHERAPY RESULTING IN SOME CURES

In none of these instances have I talked about consistent cures. We have not reached that stage, but this program of chemotherapy is now responsible for very definite cures in a small number of instances of a number of different forms of cancer in many hospitals throughout the country. Fortunately, the chemotherapy program is widespread. Through the National Cancer Institute's collaborative clinical programs under Dr. Ravdin and Dr. Sessoms, there are now in some 200 institutions more than 500 doctors studying 7,500 patients at one time in collaboration with one another.

With your permission, Mr. Chairman, I would like to insert, for the record, actual instances of clinical gains which I will not take your time to read.

Senator HILL. You mean of individual patients?

Dr. FARBER. Yes, of individual patients.

Senator HILL. Without objection, that will be inserted in the record at this point.

(The information referred to follows:)

STATEMENT BY DR. SIDNEY FARBER ON PROGRESS IN CHEMOTHERAPY OF CANCER

The greatest gains produced by the action of chemical agents against widespread cancer have been achieved against tumors of the leukemia, lymphoma, and Hodgkins' disease group; cancer of the kidney in children after spread to the lungs; the choriocarcinoma, a cancer of the uterus treated by methotrexate which was the first important chemical agent temporarily to control acute leukemia in children; the embryonal carcinoma of the testis which can be controlled by several different and unrelated chemical agents; the rhabdomyosarcoma, a highly malig-

nant tumor arising in skeletal muscle; cancer of the colon, and certain instances of cancer of the lung, the bones, the liver, and even the brain. Some of these chemical compounds, such as Actinomycin D, when used in combination with radiotherapy produce destruction of the tumor which radiotherapy alone, or the chemical alone, cannot achieve. It is possible to use very much smaller amounts of both radiotherapy and chemotherapy in such instances because of the synergistic action of these two types of treatment. This is of importance because of the toxicity of both therapeutic weapons when used in large amounts. In many hospitals now it is possible to show long-term survival of patients with acute leukemia, ranging from a year to, in rare instances, 5 to 8 years longer than the anticipated survival.

There are increasing numbers of patients with cancer of the kidney which has spread to the lungs who are alive, well, and apparently free from tumor, from 2 to almost 4 years after the use of a combined treatment with an antibiotic and radiotherapy. Women with cancer of the ovary which had spread throughout the abdominal cavity, have been kept free from pain and evidence of tumor for as long as a few years after an inoperable situation was demonstrated. It should be emphasized that, although no chemical compound available today is capable of producing actual cures in the forms of widespread "incurable cancer," occasional patients are benefited to such a degree that they are alive without evidence of return of cancer for from 5 to 11 years after treatment began.

One of the greatest contributions of chemotherapy to the cancer patient has been the availability to the surgeon, physician, and radiotherapist of one more important weapon. Using all three kinds of treatment, it has been possible to shrink many inoperable tumors and so permit the surgeon to operate effectively, and, in several kinds of tumors, to change a radio-resistant state to one of radio sensitivity.

The chemotherapy program, both in the laboratory and in the clinic, is planned to cover a broad front so that every possible promising lead can be followed by experienced and devoted investigators. The creation of the Cancer Chemotherapy National Service Center in this national program has made possible the voluntary, cooperative investigations of doctors and scientists throughout this country, and throughout a large part of the world. The directions of research have been clear since the first breakthrough in the discovery that chemical agents could even temporarily destroy cancer in man. This program, in the opinion of your Committee of Consultants, is being conducted ably, effectively, and with great zeal and devotion. It is worthy of your continued support and of expansion to the full capacity of the scientists and doctors engaged in this important field of research.

RESEARCH FOR DIAGNOSTIC TESTS

Dr. FARBER. There are two other programs, Mr. Chairman and members of the subcommittee, which were inaugurated by congressional action, and which in the opinion of the Committee of Consultants are going along well. I will just give a brief progress note.

The program concerning research for diagnostic tests is well underway.

What is very important is that we need, in addition to the very valuable exfoliative cytology technique, with which we are all familiar, a test which will be so accurate and so easily carried out on a small amount of blood that we will be able to screen the population for the presence of cancer when the cancer is small and easily removable, or easily treated by radiotherapy or chemotherapy. We are very happy to report that this program is moving at a much more rapid pace than was anticipated 2 years ago. There are going on now in a number of laboratories in this country very courageous programs, and I mention "courageous" because there has been no more discouraging field in the history of medicine than the search for a diagnostic test for cancer of the kind we have described. The immense value of such a test is realized by all of us.

RESEARCH IN VIRUSES

Finally, the field of viruses in cancer, which was aided by the action of the congressional Appropriations Committees just 3 years ago with a special appropriation, is now moving at a rate which is again far beyond our previous hopes.

There is no question that many forms of cancer in animals are caused by viruses. There is, as yet, no proof that viruses are of importance in the causation of human cancer and by "proof" I mean "final and complete proof." There is every reason to believe that there will be a relationship established between the chemical materials within viruses and the actual causation of some forms of cancer in man. When that proof is obtained, there will be hope that some method of preventing cancer may be developed on the basis of such discoveries.

We are pleased with the rapid progress in this important field. What is most exciting of all is that the theoretical biochemical basis of the relationship between viruses and cancer and the biochemical basis of the chemotherapy of cancer appear to be coming together, reaching the same site of action within the vital biochemical systems inside the cancer cells. If a wedding of these two totally diverse directions of research will take place, we can expect great practical gains for the patient with cancer.

EFFECT OF RESEARCH ON MORTALITY RATE

Senator HILL. Doctor, let me ask you this question: What can you say has been the result, up to date, of our research in this field of cancer, insofar as the mortality rate is concerned?

Dr. FARBER. Mr. Chairman, the easiest illustration that I can give in general is that the mortality rate has gone down from 1 in 4 to 1 in 3 in the last 5 to 7 years, since the great expansion in cancer research has taken place.

Now when we speak of 250,000 or more deaths per year from cancer, and when we think of the increasing amount of cancer as the population grows older, we see we are talking in terms of a great many human lives that have been saved because of this research.

I think that this can be answered, as I mentioned before, in specific instances, in small groups of patients, followed carefully by one institution in one part of the country or another, where we can actually see that what was regarded as incurable 5 or 10 years ago is now actually curable because of these great strides in cancer research.

Senator HILL. Dr. De Bakey, did you want to add something?

Dr. DE BAKEY. May I supplement Dr. Farber's remarks in this regard:

MORE CONCENTRATED ATTACK

I think there are two very important areas of progress in this field, concerning which I should like to supplement what my colleague has said. One lies in providing a more concentrated attack on the many problems of cancer which will lead to an increase in our fundamental understanding of its causation. The other is that in the practical approach to treatment, we have combined several kinds of therapy to be used more effectively in the individual cancer cases.

We are no longer concerned with just surgical treatment or radiation therapy or chemotherapy alone, but we can actually combine several different forms. We have better knowledge of how to apply these several different types of therapy in a more effective way in the individual case, and I think that, along with some of the more effective forms of radiation therapy, this has been in largest part responsible for the decrease in mortality as well as in morbidity and in the suffering as compared with what these patients have undergone in the past.

NEED TO CONTINUE WORK

Senator HILL. What Dr. Farber and Dr. De Bakey have told us is that we have made progress in our war on cancer; we have won a battle, but we still must continue this drive if we are going to win this conquest of cancer. Is that right, gentlemen?

Dr. FARBER. I thoroughly agree with you, Mr. Chairman.

Senator HILL. Any questions, gentlemen?

Doctors, we certainly want to thank both of you for your presentations here. They were most informative.

Mr. Jones.

Mr. JONES. Mr. Chairman, Dr. Leo Rigler is visiting professor of radiology at the University of California Medical School at Los Angeles and will have to leave us shortly, as he has to go back to the west coast. I have asked him if he would supplement the comments of Dr. Dempsey as to radiobiology and of Drs. Farber and De Bakey as to radiotherapy in the treatment of cancer.

Senator HILL. Doctor, we will be happy to hear from you.

STATEMENT OF DR. LEO P. RIGLER ON RADIOBIOLOGY AND ITS APPLICATION

Dr. RIGLER. This field, Mr. Chairman, is an excellent illustration of the relationship between fundamental research, as Dr. Dempsey has already described it, and the practical application.

IONIZING RADIATION

In the Division of General Medical Sciences, as well as in the Atomic Energy Commission, research programs are underway in an effort to determine what are the actual effects of ionizing radiation; that is, the radiation from X-rays, radioisotopes, protons, neutrons, and so on, upon the cell.

In spite of the fact that a great deal of work has been done in the field for many years; we are still not entirely certain as to the mechanisms involved, and it is extremely important that we learn this.

All of us are going to be exposed to radiation more and more, regardless of what we do, and we should learn how this damage occurs—and it does occur—and what we can do to protect ourselves against it.

At the same time, these ionizing radiations, which do a great deal of damage both genetically and to the organism, are very useful for treatment, and have been for a good many years. However, despite the fact that we have used them so effectively for a great many years, there are a great many important problems yet unsolved which have prevented the complete use of radiation treatment.

CHEMICALS PLUS RADIATION

Furthermore, a new field really has opened up in the last few years, in which certain chemicals which seem to enhance the effects of radiation have been used in combination with ordinary X-rays or other types of radiation, in combination, and give great promise of something more to be achieved. I might add that a notable step in this direction has come from Dr. Farber's own institute in the last few years.

Now, of course, radiation therapy is extremely expensive. It requires large numbers of personnel and very expensive equipment; so, rather large funds are needed to promote this kind of project. Furthermore, the number of cases seen at any one institution is relatively small, so it is difficult to get enough experience in one place to give us the kind of information we need as to which kind of therapy should be used, what combinations, and so on.

COOPERATIVE ENDEAVORS

At the present time, under the auspices of the National Cancer Institute, there is a cooperative endeavor in which a number of centers are working together to accumulate sufficient patient material and combine their experiences cooperatively; and I think this holds great promise for learning how to apply this type of therapy more effectively.

All of this, as I said, falls either within the province of the Division of General Medical Sciences as a fundamental program, or within the National Cancer Institute as one of the many projects such as Dr. Farber has outlined, and the committee believes strongly that increases in funds for the National Cancer Institute will have a very beneficial effect on our understanding of radiation therapy in the future.

Thank you very much.

Senator HILL. Thank you very much, Doctor, for your fine presentation.

Mr. Jones.

Mr. JONES. Mr. Chairman, we will return now to research in another field—research which is carried on under the auspices of the National Institute of Arthritis and Metabolic Diseases. Dr. Cornelius Traeger, professor of clinical medicine of Cornell University Medical School of New York, will present this statement.

Senator HILL. All right, Doctor.

NATIONAL INSTITUTE OF ARTHRITIS AND METABOLIC DISEASES

Dr. TRAEGER. Mr. Chairman and members of the subcommittee, I am here to speak concerning the recommendation of the committee of consultants for raising the budget of the National Institute of Arthritis and Metabolic Diseases by over $23 million.

I have learned not to be frightened by these figures, because I believe in what they can do; and I hope to make you believe the same thing.

PROBLEMS OF THE INSTITUTE

The National Institute of Arthritis and Metabolic Diseases has risen from predecessors within the Public Health Service and, because of this inheritance, it encompasses a great many problems—the prob-

lems of arthritis, diabetes, gastrointestinal diseases, some of the blood diseases, endocrine disorders, and others.

This segment of the whole horizon of internal medicine is so enormous that it is hard for me to equate any budgetary figures with the problems with which this Institute has to deal. The chief reason for this difficulty is the fact that so many of these diseases lie in that gray area where we do not know the cause, and I will speak to that in some detail a little later. However, they all have a common denominator in disturbances of the body chemistry.

RECENT ADVANCES IN FIELD

Now, in recent years there have been new, great advances in biochemical knowledge. Of those that I referred to briefly yesterday, one cost $2 million and the other closer to 2 cents. I am speaking here of radioactive isotopes and filter paper chromatography.

Through the availability of radioactive isotopes we can now label all sorts of compounds and, combined with the less expensive technique of filter paper chromatography, we can trace the chemical reactions which these labeled substances undergo in the tissues of the body.

Now, radioisotope work is expensive, but most of the disciplines which come under the purview of the Institute of Arthritis and Metabolic Diseases, use these techniques in great measure.

Here I would like to inject a point which may not be too germane to my topic, and that is, the separation between the laboratory expense items. It would be most unfortunate if the biochemist, the biophysicist, the bacteriologist, the anatomist and the physiologist divorced themselves from the problems of clinical medicine. It would be equally disastrous if the internists and the surgeons should try to go it alone in solving their intricate problems. Now, fortunately, I do not see any likelihood of this, because the partnership has been much too productive.

Now, let's talk about some of these things seriatim.

ARTHRITIS

Beginning with arthritis—"a" being the first letter in the alphabet, and "arthritis" being one of the labels of this Institute. Where I was born in southern Missouri, everybody expected to get arthritis. When one got to be 40 years old he expected to get gray hair, lose some teeth, and "get the miseries," as we called them, and nothing was done about it.

We have had the miseries all of our lives and this, I am sure Senator Smith will agree, is as true in Maine as it is, or was, in the Ozark Missouri country.

When I was a young doctor, an intern in the hospital, one of the things I had to do was to serve my time in the clinic, in the outpatient department. There we had patients with arthritis, and they were always put on the last bench in the back of the clinic waiting room. If we ever got to them, we had one standard procedure, to give them a big bottle of oil of wintergreen and a big bottle of aspirin and to tell them to come back in a year. That was the only treatment we had. So they did all sorts of other things. They went out and bought snake oil and they wore copper bracelets. Some of them still do.

Now, arthritis is a miserable disease. At the time of the last census there were about 11 million people in this country who had some kind of arthritis. A great many of those millions were bedridden. Some of them had to quit their jobs entirely and become public charges, and some of them were a little better off, which is true in all disease categories.

COST OF ARTHRITIS TO COMMUNITY

Measured in terms of money, the cost of arthritis to the community runs into billions. It is a miserable disease because we don't know what causes it. It is the oldest disease known to mankind. We can find arthritis in the bones of prehistoric animals, in bones millions of years old.

PROGRESS IN MANAGING DISEASE

Let's talk about progress now.

Twenty years ago when the first group of arthritis specialists in this country met, there were 15; last year there were 2,000. I can remember not too long ago that there were only four arthritis clinics in the United States. Today there are over 400.

Arthritis is a complicated disease because there are more than 60 different diseases which have as their presenting symptoms pain, swelling, and limitation of motion, and they are not all arthritis.

These 60 or more diseases range all the way from housemaid's knee to cancer of the bone, and it behooves the doctor to determine what disease he is dealing with. The patients all have the same picture when they walk into the clinic or into the doctor's office. They all have pain, they all have swelling and, if they can walk at all, they cannot move well.

PREVALENCE OF DISEASE

Arthritis is a disease which affects infants and people in their eighties. I have a photograph of two people, a dentist of 79 and a little girl of 2 years sitting on his lap, both of them recent victims of rheumatoid arthritis. It is, thus, a disease that covers the gamut from pediatrics to geriatrics.

As I said yesterday, it is impossible for me to equate money against helpless people. I once climbed up five flights of stairs to see an old lady. She was bedridden. She said, "Doctor, there is only one thing I want you to do; I don't expect you to cure me; just make it possible for me to kneel down in church; that is all I want," and she did.

Last year there was brought to my clinic a little baby about 11 months old who weighed about 13 pounds. She was all bundled up, her knees touched her chin, every joint in her body was affected by this miserable disease. She couldn't move her fingers, her elbows, her shoulders, her hips, her knees or her feet. She was in such pain she couldn't eat. She was dying of starvation. Just the approach to her bed set her off in loud painful screams.

It is strange that little children do not react to cortisone. She had been given cortisone; it didn't work. This little girl now is walking, with braces, to be sure, but she is walking; she feeds herself; she is a happy child. And she has been very useful in bringing about what I like to call teamwork, because, when she was brought to the hospital from Puerto Rico, the pediatric department, the rheumatology de-

partment, the department of physical medicine and rehabilitation, and the department of orthopedic surgery all came together at her bedside to see what they could do to save this young wreck from such a miserable disease.

Now, the mandate of this Institute, as well as of collaborating agencies within and outside of Government, is to try to find the cause and the prevention, the control, and perhaps the cure of this disease.

POSSIBLE SPECIFIC FACTOR FOR ARTHRITIS

We have very few really valuable leads, but recently we have discovered a substance in the blood which is somewhat specific for this disease. It is called the rheumatoid factor. More recently, within the past year, we found out where the rheumatoid factor originates, in the lymphoid tissues of the body. We do not know whether this important finding of rheumatoid chemistry really bears a causative relation to the disease, but it gives us an added window to the horizons projected by this problem—another avenue of research which is being most assiduously followed, both here in the Institute and in other places.

MAGNITUDE OF PROBLEM

There are many other problems associated with arthritis. Rheumatoid arthritis has many variations and in addition there are osteoarthritis, gout, and many others which I won't take your time to describe. The whole problem of arthritis is of such magnitude that when equated against money, the money does not seem to be staggering, regardless of the amount.

GASTROINTESTINAL DISEASES

Now we come to the problem of the gastrointestinal diseases and for this I have leaned very heavily on my friend Dr. Inglefinger, who is a professor of medicine at Boston University School of Medicine. Here we are dealing with a great variety of problems.

The diseases of the digestive system rank next to the diseases of the respiratory system as a major cause of disability, outranking both the diseases of the circulatory system and accidental injuries. In 1 year one-half million people are hospitalized in our country for gastrointestinal conditions, excluding hospitalization for cancers of the digestive system.

In relation to the field of cancer, of course, the nonmalignant conditions of the digestive system are less urgently dramatic and less fatal, but what they lack in fatality they make up in prevalence.

Furthermore, the suffering and tragedy caused by some nonmalignant gastrointestinal conditions rival or exceed those attending cancer. Thus, ulcerative colitis, for example, may run a fatal course, or may require surgery to create an artificial intestinal opening on the abdominal wall. The same, of course, can be said of rectal cancer, but the cancer patient is usually past middle life, whereas the colitis victim is usually in his prime.

The gastroenterologist has to learn many things. He has to learn X-ray techniques or the interpretation of X-rays, which is common to all doctors, but the gastroenterologist must also learn how to use diagnostic instruments such as the endoscope; this is a sort of periscope

that is inserted into the stomach and with it the doctor can look around and see where and what the pathology is. The gastroenterologist becomes very adept at description. He can tell us what is going on, but he has too little time to wonder why it is happening.

GASTROINTESTINAL ULCERS

Of course you are all familiar with the problem of ulcer. It is said that 1 out of 10 Americans suffers from some form of duodenal or stomach ulcer. This is becoming an increasingly prevalent disease. We are beginning to think of it as a disease of civilization. It leads in many instances to the removal of the stomach. I think the Veterans' Administration removed some 3,000 stomachs or parts of stomachs in 5 years within just their own patient population.

Well, we hope we are getting more civilized and, if this is a disease of civilization, we are likely to have a lot more stomach ulcers until through more research we can learn what causes them. This area of research is a very important part of the province of the Institute of Arthritis and Metabolic Diseases.

DIABETES

Diabetes is another disease which comes within this Institute's purview. It is a miserable disease, and it can occur in children as well as in adults in their late decades of life. It can begin at the age of 60. Diabetes is a disease of certain of the cells of the pancreas and often goes unrecognized for a long time. It is difficult to get at the pancreas in any way, by poking the abdomen or X-ray techniques or whatever.

Diabetes also has some very unhappy side effects. People can become blind from diabetes, or they can develop neurological diseases. Diabetic retinopathy is a serious business. Research is in progress on all aspects of this disease under the intramural and extramural programs of this Institute.

NUTRITIONAL AND ENDOCRINE DISEASES

I could go on to discuss the problems of nutrition and the problems of the various endocrine diseases, but, in the interest of time, I would like you to have a part of my appreciation of the enormity of the job that has been given to this Institute, the tremendous scientific horizon which its men have to encompass, the long and arduous journey they have to make on uncharted paths without very good guidance and with very little light. And if you can think of these problems as I do, I know that you will not be alarmed by $23 million.

Thank you.

Senator HILL. You see people with these diseases every day, don't you, Doctor?

Dr. TRAEGER. Yes, sir.

Senator HILL. People come to you to ask you to please do something for them; is that right?

Dr. TRAEGER. Well, the business of being a doctor who only sees patients is bad enough, but I have had the great opportunity of being not only a doctor, but also of being on the other side of the fence in the laboratory, and the impatience which comes over me when I am

in the laboratory because of the questions that I have in the back of my mind coming from the bedside is the most frustrating experience of my life.

Senator HILL. Any questions of the gentleman?

NEED FOR DISTRIBUTION OF INFORMATION

Senator STENNIS. Let me make this comment, which is not a question, but just thinking about these hearings and how valuable they will be, I just hope that the committee can find some way under the leadership of the chairman that this part of the testimony of these voluminous hearings on the entire bill can be given a wider circulation than is ordinarily given to our hearings. I hope that maybe you could put it in a separate volume, perhaps in separate pamphlet form. Some abbreviation might encourage circulation in the form of a small pamphlet. I think the American people should know more about what is said at this table.

Senator HILL. I think the Senator's suggestion is a very wise and excellent one, and we shall endeavor to bring that to pass if we can.

Sometimes they say great minds run in different channels, but in this instance great minds are running in the same channel because Senator Monroney had just whispered that same thing to me a moment ago. So we will certainly make every effort to see if that can be done. I think that is a capital suggestion, a fine suggestion.

Senator MONRONEY. Mr. Chairman, being an ex-newspaperman, I am glad to see a few members of the press here. But if we were having hearings on ICBM's or on weapons converting science into death, there would be widespread demand for seats at the press table. How unfortunate it is that this great hopeful testimony of almost fantastic progress being made is not being reported in detail through the wires of our great press associations and through our great newspapers. I really believe it would be very worthwhile, Mr. Chairman, even at some expense to the committee, to rush a transcript or several transcripts to the Senate press gallery so that this verbatim testimony would be available to those who were so unfortunate as to miss it this morning.

Senator CHAVEZ. Mr. Chairman?

Senator HILL. Senator Chavez.

Senator CHAVEZ. I am in a way very sorry that I left the chairmanship of this subcommittee. I now am chairman of the subcommittee that handles $41 billion for destruction, the Defense Department appropriation bill. I note there is requested an increase of $209 million to this bill for medical research.

May I say that yesterday we had hearings in a room three times this size and it was filled up completely, with no standing room. A request was made for restoration of $290 million for an air carrier, a conventional one, which would give more money for this class of effort and to have $41 billion generally for destruction.

I want to compliment my successor on this subcommittee. I think he has the best committee of all of them. He deals with life itself. Thank you.

Senator HILL. Thank you, Senator Chavez.

Senator STENNIS. May I add one more word?

Sentiment was expressed here for inspiring our young people to go into medicine. I believe this testimony in pamphlet form distributed

among the high school libraries and junior colleges of the Nation will be worthwhile on that additional point.

Senator HILL. I think that is a splendid thought and we shall make every effort to get this testimony to the public.

And I may say we are making every effort now, Senator Monroney, to follow out your suggestion to get this testimony to the wire services.

We shall certainly try to follow through to have this testimony printed in the form that it can be widely distributed throughout the country, as suggested by the Senator from Mississippi and the Senator from Oklahoma.

No other questions?

Mr. Jones?

CONSULTANT'S REPORT

Mr. JONES. Mr. Chairman, it was the purpose of your consultants on medical research to present to your subcommittee yesterday morning an interpretation of the consultants' report as to the questions posed to them in a rather brief and general form. It was the purpose of your consultants yesterday afternoon and this morning to comment in some detail on the effectiveness of the research carried out through the various Institutes of Health, supported by the appropriations which you have made available.

It is now the purpose of your consultants to present to you briefly comments about new areas of emphasis which appear to be important in the development of the attack on dread diseases.

Senator HILL. Good.

Mr. JONES. We have asked Dr. Sidney Farber to lead the discussion on the new concept of clinical research centers.

GENERAL AND CATEGORICAL CLINICAL RESEARCH CENTERS

Dr. FARBER. Mr. Chairman and members of the subcommittee, you will recall that a year ago your committee and that of the House agreed to appropriate $3 million to inaugurate clinical research centers throughout the country. These funds were earmarked, the first for categorical areas, for six of the categorical institutes of the National Institutes of Health.

STEPS IN DEVELOPMENT OF RESEARCH

This marked the beginning of what, in the opinion of the committee, is the single most important step in the furtherance of the program of the National Institutes of Health. The National Institutes of Health extramural grants program began with project grants which were and are of incalculable value. The next step was the inauguration of program grants, such as the pooling of support of a whole research program within a given institution. The conception of clinical research centers grew up in the minds of laymen as well as scientists and doctors because of the compelling need to meet the problems of disease in various parts of the country wherever there is a population group large enough to have disease problems of such magnitude that specialized resources for treatment, diagnosis, and research are required for the best care. The purpose is not only to make greater progress in research in such new centers, but also to make available to the patients in all parts of the country the results of research no matter what the

source of the discoveries, without the loss of time which all of us deplore.

RECOMMENDATION OF CATEGORICAL RESEARCH CENTERS

These first clinical research centers were defined after special study by the National Institutes of Health. In order to start them as effectively as possible without delay, they were placed in the custody of the National Advisory Health Council, in the form of general clinical research centers. The committee is now recommending that this general conception be continued, because of its great value to medical progress, but that in addition, the original conception of categorical research centers now be implemented throughout the country wherever there are people who can accept the challenge to do greater work than they have done before in an environment which makes such a center necessary and justifiable.

The prototype for this is, of course, in Bethesda. All of us on the committee of consultants would like to emphasize that the great Clinical Center in Bethesda represents as great a monument as the American people could erect to any project, man or idea in the history of our country. We do not recommend that clinical centers of that size be created in other parts of the country. What is recommended is that these centers, either general or categorical in nature, be established at first in institutions which now have programs of research and where there are scientists and physicians capable and willing to expand their research activities. By a general clinical investigation center we mean a facility, a research ward or a metabolic ward or an area in a hospital or medical school with supporting laboratories where clinical investigation can be conducted with the aid of appropriate financial support by pooling the knowledge and experience of doctors and scientists, representing several or all of the many phases of clinical medicine, surgery, radiology, dentistry, endocrinology, dermatology, and the many other disciplines that I will not mention.

This conception has been put into action already. The $3 million allocated last year have already been assigned to eight medical school university hospital locations in the country. Work has already begun. I might say for the committee that no project ever inaugurated through your appropriations committees has received such gratifying and enthusiastic reception by doctors and scientists and medical schools who have been waiting for precisely this kind of support in order to apply to the patient the kind of investigative talents and techniques that we have been applying to mice and to rats for some time.

NEED FOR CENTERS

Senator HILL. The truth is, Doctor, there were many more institutions that wanted one of these centers than we were able to provide, is not that true? You said there were only eight provided and there could have been far, far more if the funds had been available?

Dr. FARBER. About 40 that had programs either ready or in preparation for consideration. There are 88 medical schools. There are many more research hospitals and research institutions in the country and we must be prepared, in the case of something that is as important as this and of such great benefit to all parts of the country.

to look forward to appropriations in future years that will be far greater than the initial appropriation.

GENERAL AND CATEGORICAL CLINICAL RESEARCH CENTERS

The committee recommends to your subcommittee, Mr Chairman, the establishment of general and categorical clinical research centers. On page 93 of our report this is listed as follows:

> Funds for general and categorical research centers should be provided in the approximate amount of $55 million on a 2-year basis in fiscal year 1961, with sums for future years to be determined next spring after greater experience with the number and variety of applications for such facilities is available. This represents an increase of $52 million over the initial trial appropriation of $3 million awarded last spring.

One kind of center should be in the field of cancer for the creation of centralized programs of diagnostic and therapeutic research in a more effective and stable form than is possible today.

The same kind of categorical center should be established in all other categorical areas represented by the categorical Institutes of the National Institutes of Health.

In testimony before the House Subcommittee on Appropriations for HEW in 1959, a recommendation was made on the basis of a suggestion entered in testimony the previous year—that support be given for centers for cancer and for heart research with emphasis on diagnostic and therapeutic aspects of the problems of cancer. This represented a logical progression in the philosophy of NIH research support which began with the project grant. That type of grant will always remain a valuable device for the support of research by individuals on specific subjects. The expansion in research made possible by Federal appropriations brought about the development of larger, more stable grants for longer periods of time concerned with support of whole groups of people working on programs or in specific areas. This expansion, in turn, called for the provision of better and more facilities, and for the training of scientists. Construction and research training grants followed in logical turn.

Two considerations led to the recommendation in last year's testimony of a logical forward step of great magnitude in the Federal support of cancer research. The first has to do with the needs of patients in centers of population for the rapid application of the results of research anywhere in the world, including that in a local or regional institution. The second consideration arose from the experience of both the National Institutes of Health and the clinical research workers throughout the country that full exploitation of the great progress in research of the past 12 to 14 years could be realized only if a number of experts in the various fields of clinical investigation of cancer, supported by scientists in the several laboratory disciplines required for such clinical investigation, could conduct research on a truly professional level in adequate facilities and with full support of their efforts.

It was recommended that these cancer centers be created in independent institutions with programs independent of the National Institutes of Health. It was not intended that such centers be offshoots of the National Cancer or Heart Institutes in Bethesda, representing

nothing more than a series of colonies directed from a central source. Emphasis was placed, too, on the provision of support on the same realistic basis as that given the magnificent program of clinical and laboratory investigation in the National Cancer Institute in Bethesda.

It is clear that a plan which represents the attainment of optimal professional research conditions for the first time must be applied to the many areas of responsibility of the National Institutes of Health. What will be said in reference to cancer or heart research centers, as an example, may be applied in varying form to every one of the categorical areas supported through the National Institutes of Health. In addition, an opportunity, already explored in preliminary form through the appropriation of $3 million in the budget for fiscal 1960, emerges for the support of research in what might be called general clinical research. Here a research ward, a part or all of which might be set up for metabolic studies, can make possible with suitable support the precise clinical investigations by doctors and scientists representing the many disciplines of medicine, surgery, pediatrics, psychiatry, neurology, dermatology, and all of the other disciplines which are to be found in a research oriented hospital, either independently situated or affiliated with a medical school. These general clinical research centers represent the ideal for which professors of medicine and surgery, and the other clinical disciplines have waited for many years. The research manpower for such centers is ready and waiting, but unable to work to capacity because of the lack of the kind of support which has worked so successfully in the clinical center in Bethesda, or in small private ventures in a few institutions in the country where endowments made possible this kind of clinical research.

From a personal experience gained from visiting a number of institutions which have applied for such general clinical research center support, I can say that no venture ever supported through the NIH by funds appropriated by the Congress has ever been greeted with such enthusiasm and gratitude by doctors and scientists whose major interest is the study of disease in man.

WHAT IS A CENTER?

What is a center? This imperfect name implies the bringing together for the most effective and rapid progress in medical research of experts highly competent in their fields of activity, organized for the attainment of specific goals concerned with medical research, as for example, the prevention or abolition of a dread disease, or the solution of a problem of importance in biology and medicine. This conception includes the provision of adequate physical resources, equipment, and facilities, including support of research beds, with provision for the full cost of everything that has to do with the conduct of such research. Flexibility is of paramount importance in this conception so that full use of existing facilities, manpower, and resources may be made while deficiencies are remedied. Such centers may be organized around a specific problem, such as diagnostic and therapeutic aspects of cancer research concerned with the evaluation and development of cancer diagnostic tests; or a program of cancer chemo-

therapy which may be as inclusive as the synthesis of chemical compounds, studies of their mechanism of action, toxicity, and pharmacological properties, and the effects of these compounds on human beings with disseminated cancer.

A second kind of center may be concerned, not with problems of this kind, but rather with the provision of research resources in different parts of the country. Such resource centers may provide necessary experimental animals of the proper kind and in sufficient numbers, or deal with specialized apparatus, such as computers and other technical appliances for the application of mathematics to biological and medical problems. Expensive research instruments of large size and cost might be grouped in special installations to serve many parts of the country.

LOCATION OF CENTERS

These centers may be located in facilities or organizational units which are a part of universities or medical schools, or they may be placed in institutions which are independent, as for example, in a cancer research institute. These should be located wherever there are research leaders and institutions willing to take responsibility for leadership in research on a professional level. They should be created, if they do not exist, wherever there is a center of population with problems which demand solution as rapidly as possible.

FINANCING AND ADMINISTRATION

These centers might be supported through the existing grants program or if, in the opinion of the administration or the Congress, they could be better handled by the contract mechanism, this should be done. Confidence is expressed in the ability of the NIH to work out the administrative mechanism to meet the needs of this new opportunity.

CONCLUDING REMARKS ABOUT RESEARCH CENTERS

The support of research centers is badly needed. The amount of money available for the support of medical research has never been great enough to bring out the full research potential of the country, nor have all funds available for research been even remotely commensurate with the human or economic magnitude of the problem of dread disease. Medical research must be regarded as a professional pursuit to be carried on by the most expert scientists and doctors available, with long-term support of their research conducted in adequate facilities on apparatus suitable for the purpose. The results of medical research should be carried to man without delay. This can be done only if there is adequate support for research observations on patients in specialized clinics and research wards, with the aid of laboratories representing the several sciences basic to clinical investigation. The creation of such centers, realistically supported and located in many parts of the country, will without question accelerate greatly progress in medical research and make possible the shortening of the tragic lag which still obtains between discovery in the laboratory and application to the patient who is dying of a dread disease.

SUMMARY OF RECOMMENDATIONS CONCERNING CENTERS

1. The research centers supported through the NIH should be characterized by flexibility in design, emphasis on the correction of deficiences in a given institution (e.g., research, ward, or laboratory construction, personnel support, research equipment, animal facilities, etc.), or creation of facilities in a center of population devoid of such research facilities.

2. The research centers should be oriented toward the categorical areas represented by the several institutes in the National Institutes of Health. There should be centers for cancer; cardiovascular, neurological, or mental disease, and other dread diseases. The plans should include provision for general clinical research centers which might encompass attacks on various dread diseases as well as basic study of patients from the point of view of the discipline rather than the categorical disease.

3. The support should represent the total cost of such clinical research and should include, therefore, the cost of research beds, the supporting personnel, and also the cost of the research and equipment in the laboratories of the sciences basic to such clinical investigation.

4. The clinical research centers may be all inclusive on the basis of the knowledge of today, or may be oriented particularly toward the study of a given dread disease, such as cancer in the human, including programs for the development and evaluation of diagnostic tests, the role of immunity and vaccines in human cancer, and study of the action of anticancer agents.

5. Another form of research center may be concerned with resources such as those for the breeding of animals required for research or for the creation of computer centers.

6. The amount of support should be realistic and commensurate with the size and actual cost and the maintenance budget of such a center. It should follow in principle the splendid model created in the National Cancer Institute in its activities in the Clinical Center in Bethesda. It should include the cost of new construction, remodeling, equipping, and maintaining of facilities adequate for the task. Multiple year appropriations and award by contract would be beneficial.

The selected institutions, whether medical schools of universities, independent research institutions, or research hospitals, should give evidence of stability and continuation of an environment ideal for the purpose.

CATEGORICAL CENTER FOR HEART DISEASE

I would like now to turn over this discussion to my colleague, Dr. De Bakey, who will speak particularly concerning categorical centers for heart disease.

Senator HILL. Very well, Doctor.

Dr. DE BAKEY. Mr. Chairman and members of the committee, Dr. Farber has presented the general pattern of these centers in his characteristically lucid and eloquent manner.

I would merely like to supplement his remarks, since my main purpose is to emphasize the value and the role of these centers, particularly in regard to certain categorical areas of endeavor.

The one, of course, of which I can speak best is in the field of heart and blood vessel work or the Heart Institute category.

In a sense, the idea of the clinical research centers is not new, since this development has been taking place gradually across the country. There are many institutions now engaged in center research. This has come about through the national development of scientific disciplines and through the interest of different and diverse scientific workers in a particular field or area of endeavor.

BENEFITS OF DIFFERENT SKILLS

I could illustrate this very well by my own personal experience in this regard and indicate the benefits that can be derived from the bringing together of scientists who have different competence and skills and training in different scientific disciplines.

Senator HILL. You have a center now at Baylor University?

Dr. DE BAKEY. We have in that sense a center because of the interest of a number of workers in different aspects of the cardiovascular field.

Yesterday at lunch someone asked about the nature of the blood vessel grafts, the substitute grafts we used and I passed these around to some of them. This, I think, is a very good illustration of the benefits that can be derived by bringing together scientists of different disciplines in achievement of a specific goal. When we began this work 10 years ago, there was considerable knowledge available, from experimental workers going back over 50 years, on the replacement of blood vessels, and it is quite interesting that for more than 50 years this knowledge was available and was not successfully applied clinically. It was only within the past decade that this basic knowledge was developed sufficiently to apply clinically.

It was only after the scientific work of certain workers that we were able to understand why a graft of material of this kind could be used. This came about through the studies brought together by men who were working in different fields.

COOPERATIVE EFFORTS

It is also quite interesting that when we came to develop this sort of thing, we found that our own basic lack of knowledge in, for example, plastic chemistry, limited us. It was through the work of a plastic chemist, through the work of a textile expert having no knowledge of medicine whatever, and the combination of the work of these individuals, the work of an anatomist, the work of a biochemist, the work of a physiologist and, finally, the work of surgeons, that this has been brought to fruition, full clinical fruition, and is now used successfully in the cure of a disease which only 10 years ago was incurable.

This type of graft material is satisfactory for this purpose. We do not consider it ideal yet; so it requires a continued research endeavor of this kind.

Another good example is the problem of hypertension. Now, the problem of hypertension is a very big one, a problem of great magnitude. Scientific workers in different fields are now being brought together to study this problem from their own points of view. In recent years this has led to the development of a new surgical approach to the treatment of hypertension.

HYPERTENSION DUE TO OBSTRUCTION OF ARTERY TO KIDNEY

We now know, through the work of biochemists, through the work of internists, through the work of surgeons, through the work of anatomists, through the work of biologists, some working individually, but in many instances working together on this problem, that there are certain forms of hypertension that are produced by a partial obstruction of the artery to a kidney. This obstruction can be relieved by removal of the obstructed area and substitution with a graft, and hypertension of this nature can be completely cured.

This is merely another illustration of how problems in a specific area of endeavor, such as the heart and blood vessel area, can be attacked by bringing together these different workers from diverse fields of interest and competence. This is the concept of the clinical research center. This, I think, will constitute one of the most important forms of attack upon these dread diseases.

I should certainly like to add my own enthusiastic support to this recommendation. I have found as I have traveled about the country that there is an almost spontaneous enthusiasm for this type of support. I regard this development as one of the most important that has been conceived, perhaps next to the development of the Institutes themselves.

Senator HILL. Any questions, gentlemen?

Senator BIBLE. Might I ask just one question?

USE OF ADDITIONAL FUNDS

If you were to receive this additional $52 million, it would give you how many additional research centers?

Dr. DEBAKEY. These centers will vary in size, in terms of the nature of the support required. There are some, for example, that will require some new construction, and money should be made available for this purpose, where there are conditions that require additional facilities. There are some, however, such as in our own example, where new construction is not needed.

One of the most expensive aspects of this type of support in clinical centers is the support of research beds where the actual bed in the hospital is devoted entirely to this purpose and must be supported. This is very expensive.

I think, however, that in terms of long-range support this will prove to be the most economical way to provide research moneys for this type of research. I would say that the sum recommended should provide opportunity for something on the order of 150 to 200 research centers.

Senator BIBLE. Thank you.

Senator HILL. Senator Monroney.

Senator MONRONEY. Mr. Chairman, in our efforts to harmonize Senate actions with our colleagues in the House, it has sometimes been very strongly urged by them, and I think the record should have something in it on the affirmative side, that this would not be necessary because this would merely be doing the thing that the medical schools and research centers were already doing. I do not hold with that thesis. I do not think any member of this subcommittee does, certainly not our distinguished chairman. I believe for the purpose of the record we should have some information that might

help in pointing up the fact that without these funds there would not be the great step forward in these clinical centers that the advisers and others familiar with this great program feel could be made by Government stimulus through additional funds.

FUNDS AVAILABLE

Dr. DEBAKEY. Let me say, first, that to a certain extent, to a small extent, research centers are being developed, utilizing funds that are now available. This is being done in a spontaneous fashion because of the actual need by individuals working in certain areas in institutions, but this is done with great difficulty.

What we want to do is to encourage the development of this type of activity, and it is simply impossible to do it in any other fashion. There are no funds available for this purpose. What the individual investigators do is come together because of their mutual needs. This is far from the development of a true clinical research center. This cannot be done, I believe, in any other way than by the provision of funds for this specific purpose.

Senator HILL. Dr. Farber, do you wish to comment?

Dr. FARBER. May I add a word?

I think historically it is important to point out that the first real opportunity for clinical investigation was afforded only in an institution such as the Rockefeller Institute Hospital. For a long time it was really the only place where work of that very expensive kind could be carried on because of the great cost of research beds and of the supporting personnel.

BETHESDA CLINICAL CENTER

Then later the next great move was our own Clinical Center in Bethesda, which is an enormous accomplishment.

Wherever there are institutions in the country where medical students are taught and where clinical investigators are present, there is clinical investigation of this kind, but it cannot be carried on on the scale that it should because of the lack of money for research beds and the lack of funds for the construction of research laboratories and research wards to go along with that kind of clinical investigation.

The professor of medicine of one of the recipient institutions said recently that, when he went into medicine 30 years ago, this clinical investigation center was what he had dreamed of and what he had thought he would have when he dedicated his life to clinical investigation. After 30 years now he has for the first time the opportunity to take care of patients and study patients on the effective level on which such clinical study and investigation should be carried out. We do not have that opportunity today, Senator Monroney.

Senator MONRONEY. It has been said in opposition to adequate funding for this program that this will provide 10 additional beds which will be used in general hospital care. They argue that this is merely subsidizing hospitals is another way to provide for more beds.

CLINICAL RESEARCH FUNDS

As I understand what you gentlemen have both said today, it is that these clinical centers would utilize the services of those beds for clinical research only, which would not be possible without these funds.

Dr. FARBER. I agree with you, Senator.

Senator MONRONEY. Even though 10 beds, we will say, might be subsidized in this program to be used for clinical research, the chances are the hospital would go out and build another 10 beds for its broken legs or maternity cases. Would that not be right?

Would that be a very adequate assumption?

Dr. FARBER. That is so, Senator Monroney. The facts of the case are that I don't know of a hospital in the country, attached to a medical school or existing independently, which can afford to turn over 10 or even 5 beds for clinical investigation without special financial support.

Senator MONRONEY. I do appreciate having this information. Thank you.

SELECTION OF LOCATIONS

Senator HILL. Doctor, our good friend here, Senator Stennis, who is very much interested in this matter, spoke to me about the selection of the location of these centers. Suppose you give us a word about that, just how you would select them. You had 40 places, you said, that wanted a center. Now, there are funds for only eight available. How would you make a determination and make sure, too, that if you put your funds into a given center that those funds would be expended as had been contemplated?

Dr. FARBER. I am very happy to have a chance to answer that. Dr. DeBakey and I are on the ad hoc committee that recommended the selection of these first eight clinical research centers.

Senator HILL. The doctor is on the committee, too?

Dr. FARBER. And our chairman, Mr. Jones, is a member of the National Advisory Health Council with me and there the final decisions are made.

PRELIMINARY INVESTIGATIONS

A very detailed process of selection is made. First, very competent, dedicated administrators of the National Institutes of Health go out throughout the country, wherever there is a request for such a center, and talk with the investigators and the professors of medicine and surgery and the representatives of many other disciplines about the requirements which are specified in great detail by the National Institutes of Health administration. Then a request is made up, and this request is written in great detail. All the resources of the institution concerned with such research must be listed, including the qualifications of the personnel. Following this, a site visit is made by the citizen advisers of the National Institutes of Health with members of the NIH administration. A personal inspection is made of the quarters which will be converted to this purpose, a discussion is held with all of the investigators and administrators, and, finally, a report is made to this subcommittee on centers which then makes a recommendation to the National Advisory Health Council. That council discusses the proposals in great detail, rejects some, accepts others, and passes on its recommendations to the Surgeon General of the Public Health Service.

It is a very detailed and careful process of selection. The aim of the National Institutes of Health administration is to assist investigators

in many different parts of the country in the preparation of these requests and also to find out what their actual needs are on one hand and their ability to carry out the programs proposed on the other. The expenditure of center funds will then be audited with the usual care.

Senator STENNIS. That is certainly impressive and I think strengthens the record very greatly.

Senator HILL. In other words, in the words of Amos and Andy, you check and double check, do you not?

Dr. FARBER. Yes, indeed, sir.

Mr. JONES. May I add one comment?

Senator HILL. Yes, Mr. Jones.

SELECTION OF PATIENTS

Mr. JONES. The question has been raised from time to time in regard to these centers as to how the patients are selected. This has been a problem, I understand, for the Clinical Center at Bethesda. At times there is an effort to use these clinical research facilities for the care of patients who cannot get care otherwise, which is not the purpose. They are for actual investigative work. So these centers have arranged for teams of the clinical investigators as a group, to screen and select those patients who are to be brought in for truly investigative purposes and not merely to receive established therapeutic treatment.

Senator HILL. Good.

Any other questions, gentlemen?

Dr. FARBER. Mr. Chairman, may I add one more word?

Senator HILL. Yes, Doctor.

AUTHORITY TO TRANSFER FUNDS

Dr. FARBER. In the report the Committee of Consultants would like to call your attention to one sentence which recommends that authority be given to the administration of the National Institutes of Health to transfer funds from categorical centers to the general clinical investigation centers. I would like to get this into the record as it is stated:

> The Committee believes that this is of great importance in carrying out the development of these centers to their full. In the interest of the most effective use of funds, appropriate authority should be given to the administration of the National Institutes of Health to transfer funds from the categorical centers to the general clinical centers when the need for the latter exceeds the need in the categorical areas, as evidenced by approved applications.

There is also the recommendation that appropriation for these centers be made on a 2-year basis in fiscal year 1961 because this will help greatly the selection of the best centers during this period of time, and will permit the most effective utilization of this money.

Senator HILL. It takes time to make your selection and then, after you make your selection, it takes time to get the center properly established and operating; is not that true, Doctor?

Dr. FARBER. Yes. That is so, Mr. Chairman.

Dr. WITTSON. Mr. Chairman?

Senator HILL. Dr. Wittson.

MENTAL HEALTH CLINICAL RESEARCH CENTERS

Dr. WITTSON. My comment is on the value of these centers in mental health. I have had the opportunity to discuss this with a number of my colleagues in psychiatry, as well as with members of this committee. It is felt by my colleagues that this would be the greatest single step forward toward the implementation of a very vigorous program in psychiatry. At least six of the existing psychiatric institutes connected with universities could implement a program of this type within fiscal year 1961.

Senator HILL. Thank you, Doctor.

Any other questions, gentlemen?

Dr. Traeger.

NEED OF CLINICAL RESEARCH CENTERS

Dr. TRAEGER. Mr. Chairman, I would like to provide a definite illustration of the need of clinical research centers.

Back in 1950, when ACTH and cortisone became available, there was, as you know, a tremendous scramble by clinical investigators to find out what these drugs were useful for besides arthritis. As you also know, a great many diseases have come under intensive investigation with these steroids.

I was interested in the effect of cortisone in multiple sclerosis. As has been pointed out, it was impossible to get beds in a general hospital, even in a large hospital like the Neurological Institute of New York, where we could bring these patients and keep them under very close observation. We were using a new drug in enormous doses which necessitated all sorts of biochemical tests, very complicated ones, and it took us almost 3 years before we came up with the answers that we were looking for in the treatment of multiple sclerosis with cortisone.

In the clinical center in Bethesda these problems come up all the time. It takes from 3 to 6 months to screen a problem of this nature and come up with the answer, so you can see the urgent necessity for additional facilities of this type. Because medicine is moving fast, we are discovering new drugs all the time and have no place to work with them except at Bethesda. That is bulging out at the seams, as we discussed yesterday.

Thank you.

Senator MONRONEY. Could I ask Dr. Wittson to amplify the point that you just made?

MEDICAL TEACHING IN SPECIALIZED HOSPITAL

My experience with the hospitals I know in my own State, or the teaching hospitals and medical schools, is that they would not admit a mental patient as such, and therefore the clinical research that might go on where you have the best facilities, in the medical teaching hospitals, would perhaps have to be carried on, if it could possibly be carried on, in a specialized mental hospital, rather than in a general hospital where your specialists are more readily available. In other words, if we are going to have the advantage of specialists in general medicine and psychiatry attached to the medical schools, we would have to have some special clinical facilities in order to even open the beds to cases of mental illness that need to be studied, would we not?

Dr. WITTSON. You are correct, Senator, except that there are a number of universities now that have psychiatric units or psychiatric institutes as part of their university medical centers. There are some 12 psychiatric institutes in the country and there are other university medical colleges with psychiatric wards. We run into the difficulty of having the right kind of patients for clinical research, because clinical research requires the patients to be in the hospital and to return to the hospital, maybe three or four times. We cannot ask the individual patient to bear the cost of that. And it has been our experience that we cannot get local authorities to bear the cost of this repeated hospitalization which may be necessary, not for the patient's own care in that particular instance, but really to find out the things we need to know about his particular disease.

Senator MONRONEY. That is exactly the point I was wondering about.

Dr. FARBER. Mr. Chairman, may I make this one additional comment?

JUSTIFICATION FOR CENTER PLAN

This center plan will make possible the making up of the deficits in a number of the disciplines of medicine and surgery. One of the most important of these concerns the diseases of the eye and blindness. It is hoped that the creation of centers in a number of parts of the country will accelerate tremendously progress in research in this very important and unfortunately neglected field, and make possible much more rapidly the application of the results of research to the patient with blindness or with diseases of the eye which may lead to blindness.

Senator HILL. You gentlemen have certainly been most helpful in giving us the facts in presenting the case for these centers.

As my friend from Oklahoma indicated, we had quite a battle over these centers with some of our colleagues. They probably did not have the advantage of the testimony we had.

You made a beautiful record here for us this morning, which we appreciate very much, and a record which should be most helpful to us, most helpful.

SHORTENED APPLICATION TIME

Mr. JONES. Implied throughout the discussion we have just had on the clinical centers is the idea, which I would like to express more concretely now, that these centers will in fact tend to shorten the time between the discovery of new knowledge and its application to the patient. This, I think, is something that must be recognized as a very important factor.

Senator HILL. A most important factor.

Mr. JONES. Mr. Chairman, the committee of consultants has recognized seven new areas of emphasis. Two of these were covered in our discussions yesterday, communications research, and instrumentation research.

The clinical research centers, I think, constitute the most exciting new concept that has been made available to the scientific community. There are four other such areas. We shall cover them rather briefly.

The next item has to do with primate centers and other animal resources and we have asked Dr. De Bakey to speak to this topic.

Primate Centers and Other Animal Resources

Dr. De Bakey. Mr. Chairman, members of the committee, you will recall that last year your committee, along with your counterpart in the House, recommended the establishment of primate centers through the appropriation of approximately $2 million. Now I can assure you that this was an excellent start, but the need for this type of center is, of course, much greater. During this past year one of the centers has been activated. This will probably take up the entire amount of funds which were appropriated last year for this purpose.

There are, in addition, some half dozen other centers that are being considered. The applications have been received. The sites have been visited, and the committee's investigation of these sites of application has indicated that these are places well-suited for this purpose. There are needs for additional centers of this type.

The concept of primates as a research resource is, of course, an old one. It is not a new concept at all. The need, however, for the implementation of this concept has become increasingly urgent.

Uses of Primates

Primates, as you know, are animals that most closely simulate man anatomically and physiologically. The need to study certain responses, disturbances, and disease conditions in animal species that closely simulate man, exists in a number of very important areas.

In some instances this is the only way to gain certain types of knowledge despite all of the new developments that exist in the study of man himself. It is sometimes unjustifiable to apply these methods to the study of man in the study of clinical disease problems so that there is great need for the availability of these types of animals. This is particularly true in certain fields of endeavor, and it actually exists in almost all fields of clinical research.

The committee is strongly recommending an additional appropriation of funds in the amount of $10 million, as indicated in our report, to further this development and to activate these additional centers that are actually ready to be activated this forthcoming year.

Mr. Jones. May I make one supplemental remark.

Senator Hill. Yes.

Mr. Jones (continuing). To his statement, namely, that the committee envisions additional facilities for other types of animals, too, not just for primates, in the recommendation for additional support.

Dr. DeBakey. Thank you for bringing that out.

Senator Hill. How are the centers coming, Doctor, for which we supplied the funds last session?

Dr. DeBakey. The funds for one primate center have already been granted, and it is hoped that this facility will actually get underway within the next few months. There are, I think, five or six other centers that have been pretty well developed from the standpoint of the planning phase. They have received favorable action by the reviewing committees that have gone out and investigated them, and now await the availability of funds to proceed further. I am convinced that the plans are far enough along so that during the coming year it would be possible to develop and implement these other centers if money were made available.

Senator HILL. In other words, the plan has reached that stage where, if you had the funds, you could go ahead with the establishment of the colonies?

Dr. DEBAKEY. That is right.

Senator HILL. Senator Monroney.

ALLOCATION TO ANIMAL CARE

Senator MONRONEY. Again going back to difficulties that we have had in the past, I think we need something in the record, if you could furnish it, to differentiate between that portion of the cost that is animal care, we might say, dealing with the mere production and maintenance of the animals, and that portion of the cost that is the medical part of it.

In other words, if these were merely monkey farms, $10 million would be much too much for this, and I am certain that there is a great deal of medical study and research that goes on in this connection. I think the record would be very greatly helped if we could have that information.

Dr. DEBAKEY. Of course the establishment of the facilities for keeping animals of this kind is very costly, that is, the initial outlay. In many instances it actually requires the purchase of land and the construction of facilities for this purpose which have to be of a specialized nature. Of course, these primates are nor ordinary animals; they represent the monkeys, the apes, and so on. The maintenance of these animals requires greater and more expensive facilities than the maintenance of rats, for example, or dogs and other kinds of experimental animals. Therefore, the initial outlay and the cost of supporting these facilities must include funds that are used for this specific purpose, and not for the purpose of doing the research on the animals. That is a large segment of the cost.

Now, in the conduct of the research on these animals, in many instances this would be maintained through other forms of support such as research project grants for doing the research itself.

RESEARCH PART OF COST OF FACILITIES

However, the cost of doing research on these animals could also be included in the cost of the facilities. To differentiate the cost of the actual research and the maintenance of these animals in these centers would be, I think, very difficult to do, but one could not do the research without the facility and the maintenance of these animals. This is where the need exists.

Senator MONRONEY. This, then, will be the source of supply for most of the primates that would be used in the later stages of research?

Dr. DEBAKEY. Yes.

Senator MONRONEY I was under the impression that you were also expecting to do some environmental studies.

Dr. DEBAKEY. That is right.

Senator MONRONEY. So that the communicable diseases that are prevalent among large numbers of these primates will be studied as a part of the care in the colonies?

Dr. DEBAKEY. That is true. There would be research of that nature going on, too.

Senator MONRONEY. That is the only way that you might have large numbers of these animals that will have been under observation from birth to maybe even senility, in order to be able to study problems of aging, invironmental adaptations and many other things without which there would be a gap in the comparabi ity to human life?

Dr. DEBAKEY. Yes. This is well illustrated by, for example, certain studies in relation to perinatal factors, perinatal influences. There are certain types of studies that can be best done under these circumstances.

Now, in some respects this may require the simulation of a relatively natural environment for these animals. These are not monkey farms in the sense that they are open to the public. These are true research resources, the like of which does not exist today. The only one I know of in the world that comes anywhere near to representing this type of animal research resource is the one in Russia. It has been going on for some time and has been very valuable to the Russian scientists who actually go there to work.

The primate centers in the United States will be established with the purpose in mind, that the scientists who are interested in certain problems may actually come to these centers and spend a certain amount of time working on specific problems, or they may come to initiate a program, have it carried out by the permanent staff, and then periodically visit it.

Senator MONRONEY. This was the point on which I thought the record needed to be strenghened, indicating how this program relates beyond the mere supplying of live animals to the point where research investigators have this chance to do what you just said.

Dr. DEBAKEY. That is true, particularly for the primates. These other animal resources may constitute means of providing certain supplies of animals of specific types, certain specific animals used in a certain form of research. But these primate stations and centers are of a different category.

CARE OF ANIMALS

Senator HILL. Doctor, we have had quite a bit of testimony before this committee in connection with the care of animals, particularly care of dogs, with reference to other agencies and their research work. I am sure you would agree with this committee that while we are doing research, whether it is on the primates, the monkeys, or whether it is on the dogs, that we ought to do everything we can to give those animals the best possible care and take care of them in the best possible way; is that not correct?

Dr. DE BAKEY. Oh, absolutely, Mr. Chairman. Indeed, without giving these animals the best possible care, it is not possible to do the best kind of research. An essential part of doing good research is to see that the animals are kept healthy, to give them the best possible care, and certainly to avoid having the animals suffer. In good research centers animals are often given care that might even exceed the care given to humans in some instances.

Senator HILL. In other words, if you did not give the animals the best possible care you might defeat the very purpose of the research on the animal; is that not true?

Dr. DE BAKEY. Exactly, and that is one very good reason for good animal care, aside from what might be regarded as the humanitarian reason.

Senator CHAVEZ. Of course you do not want to get into trouble like the Food and Drug Administration?

Senator HILL. I spoke of another agency to my friend from New Mexico, but I am sure everyone knew the agency to which I had reference.

All right. Dr. De Bakey, anything else on this matter?

Mr. JONES. No, sir; unless you have something.

Senator HILL. No; I think Dr. De Bakey covered this well.

What is your next matter now, medical libraries?

Mr. JONES. Yes; and we will ask Dr. De Bakey to speak to this topic.

SUPPORT OF MEDICAL LIBRARIES IN RELATION TO RESEARCH

Dr. DE BAKEY. I will be very brief about this. I think I can afford to be, because Senator Hill is, of course, so knowledgeable in this field, having been primarily responsible for the establishment of the National Library of Medicine.

The importance of the medical library to any research institution is recognized, of course, by the scientists themselves, since it is the repository for available information in any field of activity in which the scientists are working. Therefore, it constitutes a very important aspect of doing research.

Unfortunately, libraries in general do not receive the kind of support that they need, and I think it is particularly true of medical libraries, because of the really great competition that exists in any medical center for the limited funds that are available. The urgency of many other activities simply places the library in a low order of priority of funds and, as a consequence, libraries across the country have suffered from this lack of funds and now are lagging badly in being able to be of service to the scientists. This has reached the stage, in the opinion of the committee, where something needs to be done to modernize and renovate many of the libraries to permit them to give effective services to scientists.

STATUS OF MEDICAL LIBRARIES

The committee feels that the status of our medical libraries constitutes a threat to effective progress in scientific work in many institutions, and it is for this reason that the committee believes it urgent now that consideration be given to the support of medical libraries, particularly in renovation and modernization, to permit them to bring their activities up to date to meet the needs of scientists in all areas of medicine.

For this purpose the committee has made the recommendation that funds should be appropriated in fiscal year 1961 in the amount of $5 million to support the modernization and supplementation of medical libraries.

Senator HILL. I recall that Sir William Osler said that he could not have written his monumental work on the practice of medicine but for the National Library of Medicine, which was then the Army Medical Library right here in Washington. That was just about 40 miles away and very accessible to him. What you are telling us today is

that, if we are to go forward with medical research, and achieve the best possible medical treatment for our people, we must help strengthen and fortify these libraries, is that right, Doctor?

Dr. DE BAKEY. That is right, Mr. Chairman. Dr. Alan Gregg, who of course you knew very well and who was one of our wisest statesmen in medicine, often said that one could evaluate the quality of medical care, the quality of medical teaching, and the quality of medical research of an institution by simply walking into its medical library.

Senator HILL. Dr. Gregg, I might say for the record, was for many years, was he not, in charge of the medical work of the Rockefeller Foundation?

Dr. DE BAKEY. That is right, the director of that institution.

Senator HILL. I was privileged to know him. He was one of the greatest men I have ever known. He was a magnificent man, magnificent, and perhaps no man could speak with greater authority on this subject than could Dr. Gregg.

All right, Mr. Jones.

Mr. JONES. Mr. Chairman, one other matter of concern is that of stable academic careers in research. We have asked Dr. Wilson to speak briefly to this topic.

ADDITIONAL OPPORTUNITIES FOR STABLE ACADEMIC CAREERS

Dr. WILSON. The recommendation of the committee, Senator, and members of the committee, is a very simple one. I would like, though, to take a moment to explain the background for it.

This problem derives from the fact that both the National Institutes of Health and the private agencies, the American Heart Association and the American Cancer Society, have spent over the last few years a considerable sum of money training young scientists through the training programs and through fellowships.

In order to capitalize on the talents that we have developed here, it is necessary that these young men be enabled to look forward to careers in the academic world whereby their research can be carried out.

The structure of the academic faculties is such that there are not many stable positions. The structure of the academic faculty is a pyramid, as you know, with a few tenure positions toward the top, and a large number of junior positions, which have no tenure, at the bottom. It is pretty clear that, as these young men get older and older, each one expects to get to the apex of the pyramid, but the crowding gets greater and greater as one goes up the pyramid.

The difficulty is already very apparent. The young men who have shown promise, who have been trained and are doing research, are now facing the problem of how they are going to establish themselves in a firm academic position.

PERMANENT POSITIONS

Both the American Heart Association and the Cancer Society have experimented in the establishment of permanent positions for such men very successfully with the limited resources that they had at their disposal.

The proposal which we have made is that funds be appropriated in fiscal year 1961 for the National Institutes of Health to establish 200 such positions for the coming year. This may sound like a good many,

but when one thinks of the number of young men who have been trained and the number of institutions to which they might go, I, myself believe, and I think other members of the committee will agree, that 200 will be a drop in the bucket compared to what should be done. You can see how desperate the situation is.

I will cite a specific case. As a member of the Committee on Personnel for Research of the American Cancer Society, I visited a young man a few months ago in Chicago. He was 36 years of age and was applying for a postdoctoral fellowship. He has been on fellowships since leaving college and received his doctor's degree 12 or so years ago. He was a very promising man. I could not help but recall that just before I had left to go on that visit I had recommended another young man of 36 for a full professorship. The point is that this man, whom I was visiting, also age 36, was still groping for a place.

It seems imperative that, if we are to continue to train these men, we have to have, not the lure of a permanent position, but the assurance of a permanent position in which they can capitalize on the efforts they have put into their training and we can capitalize on the money the Government has spent for it.

Senator HILL. Any questions, gentlemen?

Senator CHAVEZ. What would be the expense, Doctor?

Dr. WILSON. Sir?

TOTAL COST

Senator CHAVEZ. What would be the expense over the year?

Dr. WILSON. The proposal here is that 200 positions at $20,000 a year be supported.

Senator CHAVEZ. For each one? $20,000 a year for each?

Dr. WILSON. For each of the men. You see, what we would be expecting here is that the colleges and universities would assume some responsibility, that is the responsibility for space. Incidentally, the National Institutes of Health through its construction program is creating space, and this will be one need for which this space will be appropriately used. The institution that would accept one of these positions would perform exactly as it already has in the situation of the permanent positions established by the American Heart Association and the American Cancer Society. The institution accepts the man as a member of its faculty and as a member of a department and he, like the rest of the faculty, participates in the activities of the institution. The creation of these new positions within an academic institution is a very expensive undertaking, one which the academic institutions cannot finance alone. Nevertheless, it is necessary to broaden this pyramid in order to maintain the financial integrity of the institution and the proper support of its faculty.

Senator HILL. How many of these places did you recommend, Doctor?

Dr. WILSON. Our committee is recommending 200.

Mr. JONES. 200 places at $20,000, each, would be $4 million, Senators, the total cost. This is the recommendation.

Senator CHAVEZ. Did you request the House for this item?

Mr. JONES. No, sir.

Senator CHAVEZ. Did you appear before the House committee and make request for this money?

Mr. JONES. No, sir; this committee has not appeared before the House. This committee is of your creation, sir, and we have reported only to you.

SELECTION OF INSTITUTIONS

Senator HILL. How would you select these institutions?

Dr. WILSON. I think this would be done, Senator Hill, in exactly the same way that other grants are made. The program establishing these positions would be announced officially, and the institutions which felt they could accept one of them would submit applications. Then a competent group of men would visit the place to investigate the whole situation, and an appropriate committee would vote on the proposals and make recommendations to the Surgeon General, as in all other programs of the National Institutes of Health.

Senator HILL. You have councils for the other programs.

Dr. WILSON. That is true.

COMPETITION OF EASTERN SCHOOLS

Senator MONRONEY. Could I ask a question there?

I have had a lot of complaints from some of the heads of the medical schools in the West, who state that because of the research contracts which are being made with the great medical schools of the East, the western schools are losing men from their faculties. The eastern schools, with contracts paid largely with Federal funds, are offering salaries so much higher than those of the western schools that the latter cannot hope to offer adequate competition.

My question is: Would this type of career research man help to offset to some degree this bidding upward of the very good staffs that the western medical schools try to maintain?

Dr. WILSON. I am interested in your making that comment, Senator, because I have recently visited two distinguished medical institutions in my neighborhood, and have heard exactly the reverse—the fact that the U.S. Public Health Service in giving new finances and new facilities to the medical schools all over the country was making it difficult for the eastern schools to maintain their faculties or replace the faculties that they are losing. This is not unique. As far as your comment is concerned, I think it will be unquestionably true that the establishment of these positions would help to create places where new men could go and could be well financed.

Senator HILL. Doctor, now you figure $20,000. That really would include the salary set by the school?

Dr. WILSON. That is right.

Senator HILL. So this individual's salary would not be out of line with the other salaries, but would include an additional allowance for research expenses?

Dr. WILSON. That is right, Senator Hill, the Public Health Service would not set the salary of the man. It would make the grant to the institution, and the institution would be permitted to spend this money on exactly the same scale as it would spend its own money.

Senator HILL. Any other questions?

Thank you, Doctor. Thank you very much.

What is your next matter now, sir?

Mr. JONES. The next matter, Mr. Chairman, deserves a great deal more time than we are going to be able to give to it today, but we would like to invite attention, with brief comment by Dr. DeBakey, to the field of international medical research.

Senator HILL. All right, Doctor, take that microphone.

INTERNATIONAL MEDICAL RESEARCH

Dr. DEBAKEY. Mr. Chairman, the hour is growing late and this is of course a very important area. But fortunately, as far as this committee is concerned, you heard a great deal of testimony last year and have a great deal of knowledge and background about the desirability of international medical research. Our committee has also taken this matter into consideration in terms of its importance in furthering research and advancing knowledge in the dread diseases. I shall not go into all the reasons, since I think this is known to you anyway.

There is one aspect of this recommendation, which we made in our formal report, to which I would like to call your attention particularly. This is on page 97 of the report and is included in the last paragraph.

This is in a sense a little different addition to this subject matter. It concerns the need for a place where international forums can be held on medical matters. In our report, we make this statement:

> While the National Institutes of Health is a medical research center which attracts hundreds of people from foreign countries every year—

and indeed other institutions in this country do the same thing, we observed a good example of that this morning—

> it has no facility equipped for simultaneous translation and suitable conduct of this important aspect of medical research.

There is no other place in the country, either, for that purpose.

> As a consequence, full advantage is not being taken of many experts who lack the ability to present lectures and participate in give-and-take discussions in the English language. An international medical research facility, equipped for simultaneous translation of conferences, with rooms of different sizes for various working groups—

and so on, is needed very badly, and we make a very strong recommendation that provision be made for this specific purpose.

There are, of course, many advantages to this proposal, other than the exchange of information and the advancement of our own research knowledge, as well as that of our colleagues in other countries.

DEBT TO SCIENTISTS OF OTHER COUNTRIES

Senator HILL. Doctor, I often thought that most of us do not realize the debt we owe to scientists and researchers in other countries, how much we have gotten from other lands. When we had our hearings on our international medical and health institute bill, we had some very fine statements. You were with us.

Dr. DE BAKEY. Yes.

Senator HILL. These bore out so clearly how much we do owe to other peoples, other lands, and other scientists for what we know today. Microbiology from Holland; vaccination from Britain; I quoted a man named Pasteur yesterday; bacteriology from France. We spoke yesterday about sulfonamides. I believe they came to us

from Germany. Penicillin came from Britain. Of course, Dr. Traeger was talking earlier about diabetes. Now, insulin came from Canada, I believe. We could go down the line.

Dr. DE BAKEY. We recently had a good example of how important this international medical research activity is. We have been engaged in a very intensive study of the problem of atherosclerosis.

Senator HILL. What?

Dr. DE BAKEY. Arteriosclerosis. We have been using a method which has recently been developed called gas phase chromatography to break down the various components of the arteriosclerosis lesion.

We have become very, very interested in the hemodynamic aspect of this problem, in studying how the abnormal material gets to the artery and how it is put together in various components.

We found that there was one man in the world who has recently developed a method for doing this kind of study in Sweden, Sune Bergstrom. We were able to bring him to our center, and we became quite excited about applying the method he developed in the clinical study of arteriosclerosis, along the lines we had indicated. We are now in the process of sending one of our people to his laboratory in Sweden to learn his method. He, in the meantime, is sending one of his people to our institution to show us how it works.

EXCHANGE OF PERSONNEL

Senator HILL. Yes. In other words, you exchange personnel and, more importantly, you are exchanging knowledge?

Dr. DEBAKEY. Exactly.

Senator HILL. Let me get into your testimony one other name, if I may, Joseph Lister and antiseptics, from Britain. [Applause.]

Senator HILL. Any questions, gentlemen?

It has all been most interesting and most enlightening, Mr. Jones.

Mr. JONES. Mr. Chairman, yesterday we began our presentation of the report of the Committee of Consultants to your subcommittee with a statement by a lay member of our committee on the role of research generally, and of medical research particularly, in our national life.

We now wish to bring our testimony to a conclusion with a statement by a scientific member of our group summarizing in general our research program in this country, as we see it. Dr. Farber will do this for us.

Senator HILL. Doctor?

Dr. FARBER. Mr. Chairman and members of the committee, I think that it is important in these few closing remarks to identify the place of the Committee of Consultants under the chairmanship of Mr. Jones in relationship to the whole trend of thinking and action of your committee in the Senate.

We have made our study at a time which is not at the beginning of the curve which is going upward in the support of medical research throughout this country and now in the other parts of the world, but rather at a time when the philosophy of your subcommittee, Mr. Chairman, has already made its place in the history of medicine.

REVOLUTION IN MEDICAL SCHOOLS

There has been created by your committee and your colleagues in the House, a revolution in the medical schools and universities and hospitals of this country, a revolution which has had its impact upon medical research and practice all over the world.

We want to pay tribute to you and to your colleagues for your great vision and your wonderful conception of medical research.

Last September, Mr. Chairman, you and your subcommittee appointed a group of scientists and physicians who were knowledgeable in this field with one exception. That exception, General Sarnoff, is a man of great knowledge in the field of research in industry, and you heard his contribution yesterday. The other 11 members of this group have had periods of service as citizen advisers to the National Institutes of Health, and indeed you selected them because they had great knowledge of medical research and were particularly familiar with the problems and contributions of the National Institutes of Health. You gave to this committee a very broad charter. There were three simple questions that you wanted answered, partly because these were raised by the President last year when he signed the appropriation for the National Institutes of Health. He was disturbed at that time because there seemed to be a very rapid increase in the amount of money appropriated. He was concerned about the quality of review and that has been answered by your Committee of Consultants after objective study and the collection of facts. The quality of review of applications and the allocation of funds is more strict than ever before. There is a magnificent system in the National Institutes of Health for carrying out a review with great precision, fairness, and objective, critical judgment.

He was concerned further lest research take doctors away from the care of patients. The Committee of Consultants has brought evidence, after careful study, that the very limited diversion of doctors from the care of patients in order to do research has not resulted in any deterioration of medical care, but rather that patients are receiving better care than ever before because of the great increase in knowledge of treatment found through medical research.

Your committee pointed out also that more than 50 percent of the research workers are not medical doctors, they are doctors of science or Ph. D.'s. And such people were never concerned directly with the care of the patient. They are now coming into medical research in greater and greater numbers and making enormous contributions because of their knowledge and skill.

EFFECT ON PRIVATE GIVING

He was concerned further with a possibly deleterious effect upon private giving that an increase in Federal appropriations might have. The committee has answered that to its satisfaction. Private giving has been stimulated rather than held back.

You then gave this committee in broad directives the problem of investigating the needs of the country for medical research, with particular attention to the National Institutes of Health.

May I say at once for the committee what is stated in the report and what you heard from our chairman, Mr. Jones, yesterday?

The National Institutes of Health administration carries out an enormous program in a very effective manner, in a truly magnificent

manner, which has earned the admiration of scientists and doctors throughout this country and throughout the world. I think this is one of the greatest achievements in the history of Federal appropriations.

RESEARCH GRANTS PROGRAMS

The effect of the National Institutes of Health research grants programs on the universities, medical schools, and hospitals throughout the country I would call a revolutionary one. What it has done has been to bring democracy in action into medical research for the first time in the history of our country. For the first time there is true equality of opportunity—it is possible for research workers and doctors in every part of the country to apply for research funds in competition with their colleagues and be judged by a jury of their peers, or a series of juries of their peers.

For the first time it has been possible to have construction funds to build and equip research laboratories, and now, through your clinical research center programs, to build research wards and scientific installations within hospitals connected with medical schools or research institutes.

It has been possible for the first time to establish research and training programs anywhere in the country where there are people of ability and courage willing to take the challenge which such additional funds do bring.

I think it important to emphasize the obvious here. There are brains in all parts of the country. There is no one part of the country which has a sole claim on talent and ability. If we go to Boston and New York, to take two cities where there are great medical installations, I think it is fair to say that the majority of people who are working there come from many other parts of the country. I think this is the experience with all of the great medical centers that exist today. They have been able to attract men because there have been opportunities. By your creation of opportunities in all parts of the country, now, wherever there are problems of dread disease, we will see the growth of centers of potentially equal stature. What will happen will be determined entirely by the caliber of the people who are there and their willingness to accept and exploit the great opportunities that you are providing.

SOLVING PROBLEMS OF THE DREAD DISEASES

There is a question which was raised yesterday which I would like to answer in a little more detail. This was raised by Senator Russell. He was concerned with the possibility of medical research solving the problems of the dread diseases. I want to answer this with great care for the committee, and I know I am speaking for all of us without any qualification.

May I add a personal word. Anyone who works with patients who are suffering from what is called an incurable disease is not apt to reach for quick answers, nor will such a person succumb to false optimism.

When I left on Wednesday to come here I left the problems of 653 patients with what is called "incurable cancer". I mention this because the point of view I am going to give in answer to Senator Russell's question is based upon a critical attitude stemming from a knowledge

of what the term "dread disease" actually means. Our answer is based upon knowledge of the vast amount of research going on in this country, the tremendous potential of the country for greater amounts of research, and a knowledge of what is going on in other parts of the world.

Yesterday, in answering that question our colleague Dr. Blalock, mentioned something about heart operations and Dr. DeBakey spoke about work on vascular surgery. May I just mention that men like Dr. Blalock and Dr. Robert Gross, since 1938, when the first operation for ligation of a patent ductus arteriosus was performed on living human beings with success, have taken from the field of museum monstrosities the whole problem of congenital malformations of the heart and the great vessels. Prior to 1938, as a teacher in the medical school, I lectured each year on this subject, describing these malformations. As a teacher, all I could tell the student was a descriptive analysis of what the anatomical situation was, but I could not speak of a cure or of a remedy.

THE INCURABLE NOW CURABLE

Today, as you know, these vast improvements in techniques which have come out of medical research laboratories have caused a complete change—the incurable is now curable. I do not know that there could be a better example of the results of medical research than what most of the medical world would have called, prior to 1938, a completely hopeless field of museum monstrosites.

What I say there applies to the fantastic development in the field of surgery of the blood vessels. And Dr. DeBakey, our colleague here, is one of the great leaders in this field. When we speak of substituting for a diseased blood vessel, an artificial material—a plastic tube formed in the shape of a blood vessel, which permits the flow of blood through it, we are saying something that almost everyone in the medical and scientific world would have said was an impossibility, just not technically possible, a few years ago.

It is important to emphasize that the conditions for which Dr. DeBakey and his colleagues are called into action, are usually the consequences of arteriosclerosis. These consequences are now fortunately curable or remediable in selected patients. By their marvelous surgical technique, these surgeons are now saving lives or alleviating great distress. What is exciting now is evidence that the problem of arteriosclerosis, itself, can be solved. Many different research approaches are now under investigation—for example, the brilliant demonstration by Dr. Jessie Marmorston of the role of female sex hormone in the prevention of arteriosclerosis in the dog. Eventually, research will lead to prevention in man. We can look forward to the day when Dr. DeBakey can then turn his attention to even more difficult surgical problems which today are regarded as incurable.

CEREBRAL PALSY

There are examples which Dr. Wilson gave in the large cooperative program in the National Institute of Neurological Diseases and Blindness. What he was talking about was cerebral palsy. While the kind of work which Dr. Dempsey described in basic research laboratories concerning regeneration of the brain or nerve tissue is something

we may look forward to for the benefit of patients now afflicted, Dr. Wilson's studies and those of his colleagues will lead to the prevention of cerebral palsy. This is one of the saddest of all disabilities with which we have to deal in human medicine. It is clear, as Dr. Wittson has pointed out, that mental disease, and even some forms of mental retardation, are both preventable and curable.

I shall not labor this point further, but I would like to summarize a point of view, which I know the members of the committee share with me, and that is this: That on the basis of the great research progress of the last 15 years, particularly, and the greater possibilities for increase in research contributions which will be made possible by realistic support, we may anticipate with critical optimism that the major dread diseases with which we are now confronted will either be prevented or eradicated. This kind of controlled optimism has real meaning only when we think of adequate training grant programs and of the expansion and full utilization of the research resources we have in this country and on other countries through the world.

BUDGETARY RECOMMENDATIONS

The final point that I would like to make concerns the size of the budgetary recommendations of our Committee of Consultants.

Is this a tremendous recommendation? Last year a 35 percent increase; this year 65 percent. Is this a recommendation of irresponsible people who are taking a figure out of a hat? I would like to leave you with this thought, because this is very directly in accord with the philosophy and leadership of your subcommittee, as shown by your actions during the few last years. The size of an appropriation for medical research should depend upon only two questions: One, what is the magnitude of the problem of dread disease? What does this mean to the people of our country and the people of the world? Two, what is the ability of scientists and doctors to solve these problems of the dread diseases if you give them enough tools, facilities, laboratories and research wards, and funds to train people and develop their talents and to support the actual cost of their research?

Our committee would like to emphasize that the budget recommendation it has made after this long period of tudy, and after analysis of all of the data available to us, constitutes not a ceiling, but a floor. This floor constitutes for the first time a solid platform upon which future appropriations for medical research can be built.

When our committee makes a prediction that by 1970 there will be an annual appropriation from all sources of $3 billion for medical research in this country, we should be prepared to look at this figure carefully year after year, because the possibility is indeed great that this sum will be larger by the time 1970 is reached. If you are able to accept the point of view of our committee, we will regard our job as properly done. Our point of view is that if our budgetary recommendations are followed, this country will be able, for the first time, to mount a truly professional attack on the dread diseases afflicting our people—an attack of proper size carried out in all parts of the country by well trained scientists and physicians carrying out their research and the proper care of patients in institutions created,

constructed, equipped, and manned for the performance of the most expert investigation it is possible to achieve. Such a professional attack on the dread diseases, commensurate with the enormity of the problem, has never been possible in any part of the country. Medical research is a professional pursuit entitled to respect in its own right, and not merely an exercise to be conducted when all other medical obligations have been met. The achievements of your Senate committee, Mr. Chairman, and of the Congress as a whole in the appropriation of funds and the delineation of programs of the NIH have been without precedent in any country in the world.

The progress that you have made possible has given to doctors and scientists the courage to make plans on a scale never before attempted. The scientists and physicians of this country are willing and waiting to dedicate their destinies in such a broad conception of medical research because of their faith in the deep understanding, serious purpose, and great leadership of those committees of the Congress responsible for recommendations concerning the health of our people. Our committee of consultants, which you appointed in September 1959, has carried out your charge, Mr. Chairman. We have no hesitancy in joining with you and your colleagues in the support of the firm conviction, that given adequate support of the kind recommended, our people will see the day when the dread diseases will have been conquered.

Mr. Chairman and members of your subcommittee, we are deeply grateful to you for this opportunity to serve. It has been an educational experience for all of us here beyond compare. We are very grateful to you.

Senator HILL. May I say, Dr. Farber, Mr. Jones, and all the members of the committee—Dr. Farber, your summation has been tremendously gratifying and it has also been most challenging. You have certainly strengthened the case supporting the action of this committee during the recent years and you have also challenged us to continue to go forward with this battle for the health of our people and for the health of all peoples.

On yesterday morning, as you will recall, when we opened this meeting, I sought to express appreciation for the great work that the Committee of Consultants has done. I spoke of the personal sacrifices that you have made, how you had left your homes, your families, weekend after weekend, spent hours, days, and weeks hearing witnesses, studying these many different problems, and this question of medical care; I spoke of the tremendous job that you have done and how grateful we should be for the magnificent way in which you have done that job. And then you will recall, yesterday afternoon, just as the committee recessed, our good colleague, the Senator from Mississippi, and our good colleague, the Senator from Nevada, spoke of their deep appreciation and their gratitude not only for your work but also for the presentation, the testimony that you have given here—how striking and challenging; how true it had all been. I find myself inadequate today to really thank you of the Committee, to really express the appreciation and the gratitude that is in my heart for all that you have done.

SURGEON JOHN HUNTER

May I say this, that since I have been sitting here listening to your testimony and thinking of the work that you have done, I thought of that great surgeon, John Hunter, who was acclaimed by the Royal College of Surgeons of Britain as the founder of scientific surgery, a man so dedicated that some 200 years ago he deliberately, willfully inflicted himself with that dread disease of syphilis, that he might better study what was then such a horrible disease—not only such a horrible disease for him but for perhaps his wife, his children, and afterward. We do not know how many generations down. John Hunter, as we know, was buried first in St. Martins in the Fields and then after that his body was moved to Westminster Abbey, where it now rests. In fact, his tomb is next to that of Samuel Johnson, who was his friend and his patient. Incidentally, Sir Joshua Reynolds, the great artist, was also one of John Hunter's patients and did a portrait of John Hunter. But at the tomb of John Hunter in Westminster Abbey today we find a tablet placed there by the Royal College of Surgeons of England and that tablet reads as follows:

The Royal College of Surgeons of England has placed this tablet on the grave of John Hunter to record admiration of his genius as a gifted interpreter of the Divine power and wisdom—

and that word "divine" is capitalized—

as a gifted interpreter of the Divine power and wisdom at work in the laws of organic life and its grateful veneration for his services to mankind as the founder of scientific surgery.

INTERPRETERS OF THE DIVINE POWER

I think perhaps the best that I can say to you, my friends, is, as we have sat here with you these last 2 days, we can be proud of the fact that we have here in our country gifted interpreters of the Divine power and wisdom at work in the laws of organic life for the health of our people, for the health of all peoples, for humanity, for all of God's children.

Gentlemen, if there are no questions or anything else you would like to add—Mr. Jones.

Mr. JONES. Mr. Chairman, I would just like to express formally as Chairman of the Committee of Consultants the appreciation of each of us for this very exciting opportunity and challenge which you made possible for us.

It would be anticlimactic to add to the words of Dr. Farber and certainly to the words of the Chairman of this committee, so eloquently spoken.

Speaking for myself and for my 11 colleagues I would like at this time to introduce again and to thank Dr. Margaret Sloan, for the very effective job as staff director that she has done for us.

Dr. Sloan, would you stand up?

Senator HILL. Stand up, Doctor.

Dr. SLOAN. May I thank my assistants, Mrs. Storrer and Mrs. Wootton, for unsurpassed support?

Mr. JONES. Mr. Chairman, we consider ourselves discharged but our interest will be continuing.

Senator HILL. You are discharged but you are in the reserve corps. You are subject to recall to active duty any time, and I will have to be very frank with you and say that I am quite certain you will be recalled to active duty. We are deeply grateful.

REPORT OF COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

We have had expressions from a number of our subcommittee members urging the widest possible distribution of our hearings of yesterday and today. I have directed the clerk to have the hearings with our committee of consultants printed in a separate volume, and the report itself will be placed in the hearings at the conclusion of today's meeting.

(The report referred to follows:)

FEDERAL SUPPORT OF MEDICAL RESEARCH

REPORT

OF THE

COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

TO THE

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LETTER OF TRANSMITTAL

Hon. LISTER HILL,

Chairman, Subcommittee on Appropriations for the Departments of Labor, and Health, Education, and Welfare, Committee on Appropriations, U.S. Senate, Washington, D.C.

DEAR SENATOR HILL: The Committee of Consultants on Medical Research, established by your Subcommittee in response to a resolution passed by the Committee on Appropriations of the U.S. Senate on June 23, 1959, was asked "to determine whether the funds provided by the Government for research in dread diseases are sufficient and efficiently spent in the best interests of the research for which they are designated * * *."

The Committee has now completed its review and herewith transmits to you as Chairman of the Senate Appropriations Subcommittee on the Departments of Labor, and Health, Education, and Welfare its final report containing the principal findings and recommendations pertinent to its mission.

In the course of its study the Committee heard testimony presented by more than 100 expert witnesses; it reviewed numerous documents and reports, both published and unpublished, and new information gathered at its request. It reached its judgments after extended discussions by unanimous agreement. A summary of these judgments, and the recommendations based upon them, will be found at the beginning of the report.

The Consultants found the assignment to be both challenging and rewarding. They will be pleased if their report communicates effectively their conclusion that Federal funds provided for medical research, while substantial and efficiently used, are not sufficient for full utilization of the country's medical research potential in the national effort to attain solutions to the problems of serious disease.

The Committee records its appreciation for the complete freedom of action given to it, for the full response by witnesses and resource experts to its requests for information and opinions, and for the devoted and effective services of its staff.

Respectfully submitted.

BOISFEUILLET JONES, *Chairman.*

APRIL 20, 1960.

ACKNOWLEDGMENTS

In the submission of this report the Committee of Consultants on Medical Research [1] wishes to express sincere appreciation to the Senate Appropriations Subcommittee on the Departments of Labor and Health, Education, and Welfare for giving it complete freedom of action and all possible support in its survey.

Throughout the course of the Committee's activity the most complete cooperation was extended by all Government agencies from which information was requested. The Committee would particularly like to express its gratitude to the administrative staff, the Office of Program Planning and the Division of Research Grants of the National Institutes of Health, and to the Office of Special Studies of the National Science Foundation. The efforts of the Resources Analysis Section of the Office of Program Planning to make valuable and pertinent information available, in some cases before formal publication, were deeply appreciated.

Many individuals and groups outside the Government were extremely helpful and the Committee would especially like to thank Dr. Ward Darley of the Association of American Medical Colleges and the late Dr. Edward Turner and Dr. Walter Wiggins of the American Medical Association for opening their great stores of information for its use.

In the vast amount of material which it reviewed, the Committee found two recent survey reports of exceptional value and will refer to them repeatedly in the pages that follow, namely:

U.S. Department of Health, Education, and Welfare, Office of the Secretary. *The Advancement of Medical Research and Education Through the Department of Health, Education, and Welfare: Final Report of the Secretary's Consultants on Medical Research and Education, 1958* (The Bayne-Jones Report).

U.S. Department of Health, Education, and Welfare, Public Health Service. *Physicians for a Growing America: Report of the Surgeon General's Consultant Group on Medical Education, 1959* (The Bane Report).

The Committee wishes to give high praise to these survey committees and regrets that many of their recommendations have not yet been implemented. It hopes that the additional endorsement given to some of their recommendations in the present report will confer enough added impetus to be translated into concrete action.

If the recommendations of these two reports and those included in the following pages are carried out the Committee feels confident that the progress in medical research in the years ahead will assure the fulfillment of the health goals of our people.

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[1] The terms "medical research" and "medical education and training" are broadly interpreted by the Committee to include educational, research, and research training activities in such institutions as schools of medicine, osteopathy, dentistry, and public health, universities with strong programs in the life sciences, independent hospitals, and research institutes. The term "practice of medicine" is intended to include the practice of dentistry and osteopathy.

SUMMARY

The United States today is experiencing the development of a medical research program of a vigor and productivity unparalleled in history. This phenomenon is a typically American enterprise combining private and governmental efforts in successful collaboration. As a result, our pool of trained manpower has been greatly expanded; we have developed many well-equipped laboratories, and our background of knowledge as a basis for further progress has been enormously enriched. Most important, Federal funds have been provided without interference with the freedom of the research and teaching institutions or of the individual investigators.

The great advances already forthcoming from this program justify the expectation that, through medical research, the span of useful, enjoyable life can be still further lengthened, and that the benefit to society of longer, healthier, and more productive lives will be far greater than the cost of the research required to reach that goal.

The magnitude of the problems of disease and disability confronting our people today is still so vast as to be beyond the comprehension of most of us. The nature of our enemies has shifted from the communicable diseases to the chronic disorders, and especially to cardiovascular-renal disease, cancer, mental illness, and other problems predominating in the older age group which has been greatly increased in numbers. Aside from the unhappiness and tragedy represented in the incidence rates of these conditions, we should remember that the present cost of disease and disability to our nation is estimated as at least $35 billion a year. Only through medical research and the application of its findings can these losses be reduced.

The people of the United States have demonstrated through their Congress and through their private voluntary contributions that they consider it essential and urgent to support a determined attack on the dread diseases. Such an attack will require the full mobilization of the Nation's potential for medical research. This can only be achieved with substantial financial support, a major part of it from the Federal Government.

The Committee of Consultants on Medical Research was constituted in response to a resolution passed by the Committee on Appropriations of the U.S. Senate on June 23, 1959. It was asked "to determine whether the funds provided by the Government for research in dread diseases are sufficient and efficiently spent in the best interests of the research for which they were designated * * * (and to) take into account the facilities, the experts, the laboratories, the availability of private funds and all other factors including the possible impact which the recruitment of those engaged in research enter into such a study of research efforts."

The findings and recommendations of this Committee are presented in the following report and are summarized briefly below.

I. Adequacy of Federal Support of Medical Research

The funds provided by the Federal Government in support of medical research over the past 15 years have been substantial. Although generously increased in recent years, they have not kept pace with new opportunities in research which have developed, largely as a result of the very advances which the funds expended in the past have generated. They are still not sufficient to assure the full utilization of the Nation's present potential for an attack on dread disease, and the current level of support is far from adequate to permit the great advances essential for the future.

II. Effectiveness of Utilization of Federal Funds Appropriated for Medical Research

Considering the Federal research program as a whole, the funds appropriated by the Congress for the support of research on major disease problems have been expended by Federal agencies with remarkable efficiency. The National Institutes of Health, which Congress has made its principal instrument for the disbursement of funds for medical research, has developed an extremely successful system for review and approval of applications for research grants, training grants, and fellowships. This plan, relying on close supervision of outstanding scientists, has assured consistently high standards for the research supported, gained the confidence of the scientific community and maintained the traditional freedom of both institutions and investigators.

In the expanding program of medical research which the Committee foresees for the future, new methods must be developed for the administration of funds which will continue to preserve the freedom of the investigator and the integrity of the educational and research institutions, and which will be able to deal with new organizational patterns of research to be described subsequently. In large new programs the Congress should be encouraged to authorize funds on a 2-year basis (or more) to allow time for effective planning and the recruitment of appropriate personnel.

III. Impact of Expanding Federal Program

A. EFFECT ON MEDICAL SCHOOLS

The impact of the Federal program in support of medical research on medical teaching has been extremely beneficial and has been largely responsible for an improvement in standards of medical training. The number of teachers has increased and the research facilities of the institutions have been greatly improved. The proportion of teachers participating in research has risen, medical students have been inspired by the atmosphere of inquiry created by the research in progress, and the medical graduate of today has a much better conception of the possibilities and practical contributions of research than did the graduate of a generation ago.

However, the expanded program has posed problems for the medical schools, chief of which is the mounting cost to the institutions of the research undertaken by its staff. On all research grants supported through the National Institutes of Health the payment of the costs of research incidental to its performance is limited to 15 percent of the total direct costs. This is not sufficient in most institutions, and the deficit has to be met by diverting funds from other important needs. The National Institutes of Health is the only Federal agency making research grants which is under such restriction. The Committee recommends strongly that this unfair discrimination be remedied by permitting the National Institutes of Health, like other Federal agencies, to pay either the full costs of research as determined by a cost analysis formula, or a fixed flat rate, whichever is lower. The Committee believes that at the present time the flat rate should be set at 25 percent of the total direct costs.

Other methods recommended for strengthening the medical schools include institutional grants, the construction of health educational facilities, an increase in training programs, and the provision of additional stable career opportunities in academic medicine.

B. EFFECT ON MEDICAL PRACTICE

The expanding program of medical research has made tremendous contributions to medical practice in terms of new knowledge, techniques, and methods of treatment and has been a prime factor in raising the standard of medical care to the highest level ever achieved. Through the findings of medical research, the doctor of today has been equipped with powerful ammunition for the treatment of disease—ammunition which has enormously magnified his effectiveness as compared with that of the doctor of a generation ago.

Moreover, some of the training programs of the National Institutes of Health have trained psychiatrists, neurologists, ophthalmologists, and other specialists who were previously in short supply, so that our population is more adequately supplied with physicians competent in these specialties than ever before.

These gains have more than compensated for a limited diversion of physicians from practice to research and teaching and for the developing quantitative shortage of medical manpower.

C. EFFECT ON NON-FEDERAL SOURCES OF SUPPORT

The Federal program has served as a stimulus rather than a deterrent to non-Federal sources of financial support of medical research. The annual contributions of the foundations, the voluntary health agencies, industry, and the States have all increased markedly in the past 15 years. The great diffusion of health knowledge to the public from both Federal and non-Federal programs has been mutually beneficial, and the greater consciousness of the needs of medical research on the part of the public has resulted in both an increase in support of medical research through the foundations and voluntary health agencies and an increased determination on the part of the taxpayers to support medical research through their tax dollars. In addition, the matching fund programs of the Hill-Burton hospitals and of health research facilities construction have served as a stimulus to non-Federal sources to contribute still more generously.

IV. Status of Medical Manpower

A. NUMBER OF PHYSICIANS

The United States, with a rapidly expanding population and an increasing demand for medical service, faces a growing shortage of physicians and dentists. The Committee recommends strongly that the measures outlined in the Bane Report be implemented at the earliest possible date, namely: (1) the expansion of existing schools to the maximum extent compatible with maintenance of high standards of training; (2) the establishment of 2-year schools to fill the vacancies existing in the third-year classes of our present schools because of dropouts in the first and second years, and (3) the construction of approximately 20 new 4-year medical schools and 22 new dental schools. It should be emphasized that, no matter what measures we take today, the number of graduates through 1963 is fixed by the number now enrolled.

Because of the long lead time required to build a medical school and graduate its first class, the Committee strongly recommends support of pending legislation which proposes that the Health Research Facilities Construction Act be amended to include the construction of health educational facilities, and that funds be authorized over a 10-year period at an initial rate of $60 million per year to support the Federal share of a long-range program of renovation, expansion, and new construction of schools of medicine, dentistry, and public health.

B. RECRUITMENT OF PHYSICIANS

There has been a decrease in the number of young people choosing medicine as a career at a time when the number of college graduates is increasing. This is a serious development if we are to increase the number of our medical graduates by 3,600 per year by 1975 as recommended in the Bane Report. The

most important reasons for this apparent loss in popularity of medicine are the great length and high cost of medical training. The Federal Government is extending a large measure of fellowship support to every field of higher education in the sciences except medicine. Many young men and women who might have applied to medical schools have therefore taken the shorter and less expensive route of a career in the basic sciences, the number enrolled having risen markedly in the past 5 years. This situation should be remedied by an intensive information program at the high school and college levels to acquaint young people with the challenge, opportunities, and rewards of a career in medicine, and by a strong Federal program to supplement private and State sources of funds in providing extensive scholarship support for medical students.

C. MANPOWER FOR RESEARCH

The Committee disagrees emphatically with those who hold that further expansion of the medical research effort of the country is impossible because of the shortage of manpower. Physicians and dentists constitute less than half of the professional personnel engaged in research. Since the number of Ph.D. graduates is increasing rapidly and the number of supporting personnel is almost limitless, and since modern equipment and techniques have enormously magnified the productivity of the individual investigator, the present relative shortage of physicians and dentists is not a limiting factor on the expansion of our research effort. The manpower is available for a remarkable growth of the present program.

V. Government Agencies Other Than the Department of Health, Education, and Welfare

Government agencies have made distinguished contributions to our store of medical knowledge, and the provision of adequate support for their programs of medical research is basic both to their special research needs and to a full national medical research effort. This applies particularly to the Public Health Service and its research arm, the National Institutes of Health. It also applies to the Department of Defense, Veterans' Administration, National Science Foundation, and the Atomic Energy Commission.

The Committee finds that there are excellent research opportunities in the hospitals of the three branches of the armed services and of the Veterans' Administration which are not being fully utilized because of lack of funds. The Committee considers this most unfortunate because a strong research program in a hospital has been found to be one of the most potent stimuli to the staff in maintaining the highest standard of medical care. Moreover, these hospitals can make an important contribution to research on major disease problems.

The most serious deficiency of the medical research programs of the Department of Defense at present is in the special medical research institutes of the services. Here the level budgets of recent years and the rising costs of research caused by inflation have forced a reduction in personnel and have pre-

vented the purchase of needed supplies and equipment until the research productivity of these institutes is being gradually reduced. Adequately supported, these fine facilities, built at the taxpayers' expense, would be capable of making a tremendous contribution to the special research needs of the respective services, as well as to research on serious disease.

The Committee has therefore recommended a substantial increase in the medical research budgets of the three armed services and the Veterans' Administration for fiscal year 1961.

VI. Department of Health, Education, and Welfare, Public Health Service

The Committee has refrained from specific recommendations regarding the divisions of the Department of Health, Education, and Welfare other than the National Institutes of Health. The Public Health Service has just completed a study aimed at reorganization of its administrative structure in order to centralize closely related activities and prevent overlapping functions. The Committee hopes that the new pattern will permit more effective coordination of research and policy in the fields of environmental health and problems of aging.

VII. The National Institutes of Health

After reviewing extensively the organization and programs of the National Institutes of Health, the Committee wishes to add its praise to that of all other professional groups which have studied this agency, and to express confidence that the remarkably dedicated and competent staff will meet the challenge of the larger programs in the future with the same wisdom and flexibility it has shown in the past.

The greatest difficulty of the National Institutes of Health at the present time is in regard to personnel. In the top administrative and scientific posts there are today many gaps which it has been impossible to fill with competent people. This is chiefly because the salary structure for such positions is no longer in a favorable competitive position with medical schools and industry, and because the manpower base of the Public Health Service is too small to provide enough individuals of high competence from within the commissioned corps to staff the Bureau of Medical Services, the Bureau of State Services, the Office of the Surgeon General, and the National Institutes of Health.

The Committee has therefore recommended (1) an increase in the salary ceiling for specially qualified scientific and other professional personnel authorized by section 208(g) of the Public Health Service Act and in the number of these positions allotted to the National Institutes of Health; (2) that a larger proportion of the top-ranking personnel be recruited from outside the Public Health Service; and (3) that section 214 of the Public Health Service Act be amended to permit assignment of a limited number of commissioned officers to the civil service system.

The second greatest requirement is for more office space to permit all units of the National Institutes of Health at present dispersed in various distant office buildings to return to the campus in Bethesda where they can carry out their duties more effectively in collaboration with the rest of the National Institutes of Health staff.

Other space needs include a building for the intramural programs of the National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health, a physical biology building, and development of the animal farm.

Of special interest is the urgent need for an international conference center which would provide facilities for holding multilingual conferences and working seminars in the field of medical research. Such a building would serve as a symbol of the role the Committee believes the National Institutes of Health should play in international medical affairs and would greatly aid such activities.

Under problems of organization, the Committee has recommended institute status for the Division of General Medical Sciences and a special council separate from the National Advisory Health Council.

Among the administrative patterns which will be needed for the larger programs of the future, the Committee has recommended program grants, institutional grants, a greater allocation of funds to general or categorical clinical research centers and to special resource centers, and a greater use of collaborative programs in situations in which these are clearly indicated.

VIII. Projections

The mobilization of the Nation's medical research potential for a determined attack on the problems of disease and disability will require the full utilization of all research resources available.

In the case of the armed services and the Veterans' Administration, more generous appropriations will permit the development of vigorous research programs in those hospitals in which they are now inadequate or lacking, and the realization of the great opportunities for major research contributions in the medical research institutes of the services.

The Atomic Energy Commission should be given the full support required to carry out its research mission in the field of radiation biology and the prevention and treatment of radiation damage and sickness in man.

The National Science Foundation should receive increased appropriations to safeguard the area of basic research which, by greatly augmenting our store of knowledge, will provide a base from which many new avenues of research will open, some inevitably leading to valuable applications in medicine. The important programs supported by the National Science Foundation to improve the standards of science teaching in the secondary schools and colleges should be greatly expanded and with enthusiasm. These, more than any other measures, will help in the recruitment of young people into the sciences.

Research pertinent to medicine undertaken in the Department of Agriculture, the National Space Agency, and the Food and Drug Administration

must not be neglected, and these organizations will be involved in an intensified program of environmental health under the supervision of the Public Health Service. Proposals for a soundly based program in environmental health will soon be forthcoming from the Public Health Service and should receive the most serious consideration and ample support.

PROJECTIONS FOR THE NATIONAL INSTITUTES OF HEALTH

A resolute attack on the dread diseases will require a level of medical research expenditures each year from both Federal and non-Federal sources combined which will be sufficient to give adequate support to all research judged to be of high quality and potential productivity by competent scientific advisers after careful and critical review.

At the rate of growth of research potential indicated by the rising number of new research grant applications of high quality received each year by the National Institutes of Health and by the increasing number of scientists in the research training programs, this attack will require substantial advances in the level of support each year until a reduction becomes possible as these programs are successful in the attack on disease.

In considering the future budgetary needs of the National Institutes of Health the Committee has recognized (1) that major infusions of funds into the Federal program through the National Institutes of Health in the past have been readily absorbed and have resulted in a great increase in research potential and performance, and (2) that the National Institutes of Health staff has shown great ability to administer wisely the funds entrusted to it and great ingenuity and flexibility in adapting administrative patterns to changing needs.

The Committee has divided its consideration of the future requirements of the National Institutes of Health into two sections: (1) the continuation of the present program, and (2) new areas which should receive greater emphasis in the future.

A study of the growth of the National Institutes of Health research grant program in recent years has led the Committee to the conclusion that a conservative estimate of the funds required to support (1) continuing commitments and supplemental requests, (2) the increase in new research grant applications anticipated over the number received in 1960, and (3) a 10 percent increase in the allowance for the costs of research on National Institutes of Health research grants, would total approximately $300 million in fiscal year 1961.

The need for growth in the training grant program to supply the teachers and investigators required for the future is readily apparent. Expansion is essential at various levels: in the hospitals, universities, and research institutes to improve the training for academic careers and to develop certain types of specialists still in short supply; at the predoctoral level to encourage and help support medical students interested in research and academic medicine; and also at the college level to recruit more college students into the medical sciences. The Committee has recommended an increase in the training programs of $57 million to a total of $132 million. This sum would include (1) $14 million for

training grants approved but unpaid in fiscal year 1960, (2) approximately $20 million for expansion of the training programs, and (3) $22.7 million to complete the adjustment of all continuation training grants to a forward notification basis. The last is a nonrecurring item which actually does not represent an additional cost to the Government, but merely advances the time of payment of funds.

For fellowship support an increase of $7.9 million to a total of $22.5 million is recommended: (1) to award fellowships approved, but unpaid in fiscal year 1960; (2) to award new fellowships from a greatly expanded list of applicants; (3) to expand the senior fellowship program to include clinical research; (4) to develop special fellowships in preparation for careers in academic medicine; (5) to increase the number of part-time fellowships which give encouragement and support to research-oriented medical students; and (6) to increase the number of foreign fellowships.

The intramural program is considered to be approaching its optimal size and further growth should be necessary only in the improvement of equipment and research resources and allowance for the rising costs of research. An exception will be the new facilities proposed for the intramural programs of the Institutes of Neurological Diseases and Blindness and Mental Health. The Clinical Center is functioning smoothly and is making outstanding contributions. It is for the most part excellently equipped, but needs some minor additions. A total of $107 million is recommended for all direct operations, $11.4 million more than in fiscal year 1960. Under a separate appropriation $4.4 million is recommended for planning and construction.

One of the Nation's greatest needs at present is for the construction of facilities for both medical research and education. The Committee has recommended that the authorization for health research facilities construction be extended for 5 years after the present expiration date and that the level of appropriation be increased from $30 million to $50 million per year. Furthermore, it has recommended modification of the Health Research Facilities Construction Act to include multipurpose buildings for research and teaching when the teaching activities are closely related to the research performed. Because the need for these facilities is so great in some areas where matching funds are exceptionally difficult to obtain, the Committee has recommended some modification of the 50–50 matching formula in cases of clear justification and urgent need, according to criteria to be established by the National Advisory Council on Health Research Facilities.

There are seven areas or programs in which the Committee believes new or increased emphasis should be placed in the future. These include: (1) general and categorical clinical research centers; (2) primate centers and other animal resources; (3) modernization and supplementation of medical libraries in relation to research; (4) communications research; (5) instrumentation research; (6) increased opportunities for stable academic careers, and (7) increased support of international medical research. The funds required for these programs would represent a further increase of $87,500,000.

In the opinion of the Committee, the most promising and challenging program of those mentioned is the establishment of clinical research centers,

both general and categorical, which will afford opportunity for a multidisciplined attack on disease problems supported by all the necessary skills, techniques, and equipment which modern medicine can provide, and with bed support assured while the patients are under study. These centers will afford the most comprehensive, refined, professionalized and productive study of disease yet imagined. The center concept has been received with great enthusiasm across the country, and there is no question but that it answers a long unmet need which was only brought into focus when funds were made available for a start on this program in the first session of the Congress.

Another type of center strongly advocated by the Committee would be oriented around a specific resource or approach. These would include primate centers and other special animal resources, special facilities for biophysical measurement, computer centers for data processing, biostatistical analysis, communications research and translation, etc. Most of these resource facilities are too costly to be established in relation to an individual project or program grant, or even to a single school or research institute, and it is therefore proposed that these be established on a regional basis with major Federal support. These facilities would be available to qualified investigators from the research institutions of that area, but one institution would carry the main responsibility for administration. Support will have to come primarily from the Federal Government and funds for such centers are included in the additional $87,500,000 recommended by the Committee for areas of special emphasis.

In summary, the Committee believes that the present programs of the National Institutes of Health could use effectively in fiscal year 1961 the sum of $576,500,000 for the orderly growth and development of its present program, or an increase of $176,500,000 over the present year's appropriation. Seven new areas justifying special emphasis would add an additional $87,500,000, making a total budget of $664 million, or $264 million more than the current appropriation of $400 million.

Under separate appropriations the budget should also include $4,400,000 for intramural planning and construction at the National Institutes of Health, $50 million for Health Research Facilities Construction (an increase of $20 million over the present level) and $60 million to initiate a program of Health Educational Facilities Construction.

This level of support would assure the effective utilization of the Nation's present potential for medical research and would allow the growth which the Committee believes necessary. The appropriation of less than the amount suggested may mean a consequent postponement of the time when answers to major disease problems could become available.

In consideration of the growing demand for medical care of our expanding population, the increasing health consciousness of our people and their realization that health can be improved through medical research, and taking into account the growth in knowledge, manpower, and facilities which seems certain to occur, the Committee believes that by 1970 the total support of medical research in the United States will probably require the expenditure of $3

billion, of which more than $2 billion will in all likelihood come from the Federal Government. If the economy grows, as now seems probable, at a rate of 4 to 5 percent per year, we may attain a gross national product of over $775 billion by 1970 and should have the resources to achieve a medical research program of this magnitude.

Thus the Committee concludes that if adequate support is provided, the great advances in the medical sciences which this country has witnessed in the past 60 years, remarkable though they are, will prove to be only the prologue to the great human drama which will be played in the battle against disease and disability during the decades immediately ahead.

INTRODUCTION

The Committee of Consultants began its review of the Federal program in support of medical research with certain assumptions which it found to be sound on the basis of the information obtained and the opinions heard in the course of its survey. These assumptions have now become firmly held convictions.

(1) The health of the people is the greatest resource of the Nation, absolutely vital to its welfare, economy, and security.

(2) The present state of the Nation's health, although greatly improved since the beginning of the century, is still far from the goal of assuring that as many of our population as possible live full and active lives, not warped or blighted by disease. The great tragedies of chronic illness and early death still afflict a tremendous number of our people. New toxic factors in our environment are producing effects which are still only dimly understood, but which seem to be contributing to an increase in the death rates from cardiovascular disease and cancer.

The magnitude of the problem of disease and disability today is difficult to grasp in any form that is meaningful to most of us. Such figures as 900,000 deaths per year from cardiovascular-renal disease and 255,000 deaths from cancer, our main causes of death; or 16 million people disabled by mental and emotional disorders, 16 million by cardiovascular disease and 11 million by arthritis; or the great cost of illness which amounts to a total of at least $35 billion a year, $15 billion in private expenditures, $5 billion in Government expenditures, and $15 billion in disability losses (approximately $195 per year for every man, woman, and child in the United States); still do not register in our minds or our emotions.

These facts have real impact only when someone near to us is stricken by severe disease, and especially when the victim is a child or young adult who has so much to live for and so much to give, or when support of an aged invalid relative saps the vitality and financial strength of a whole family, or when some outstanding national figure of genius and great ability is prevented by early death from continuing his vital contribution to human knowledge and welfare.

(3) The only way we can hope to lessen this burden in the future is through progress in medical research and the practical application of research findings.

(4) Medical research has already proved its value in both humanitarian and economic terms. In the great battle which has been waged against disease and disability since the turn of the century, we have secured a position through medical research in which the life expectancy of a child at birth has been

increased a full 20 years. Moreover, his life is generally far healthier than that of his parents or grandparents, almost completely free of the dangers of communicable disease and the complications of malnutrition, and with the fatalities from accidents reduced through advances in our knowledge and skills in medicine, surgery, and anesthesia. The value of these lives saved is impossible to assess, but each of us who has a child whose life has been preserved by the wonders of modern medicine will be forever grateful.

In economic terms we can recognize that medical research has saved the lives of more than 1,800,000 individuals in the past 15 years. The annual earnings of those whose lives have been prolonged now amount to over $3.6 billion and their tax contribution to the Federal Government to $263 million per year. The control of infectious diseases and the reduction in infant mortality since 1900 have provided the manpower with which we have fought two world wars and the Korean action and have at the same time doubled our population. These savings were accomplished with a relatively small investment of funds in medical research which, we must therefore conclude, pays remarkably high dividends.

(5) The American people have demonstrated through their Congress and through their private voluntary contributions that they consider it essential and urgent to support a determined attack on the dread diseases through research.

(6) The magnitude of that attack and the program of medical research to be supported will be determined by the degree of urgency felt by the people of the United States in obtaining answers to the problems of prevention and treatment of serious disease. The Committee believes the urgency is such that it can be satisfied only by the maximum utilization of the medical research potential of the country, as well as the contributions of competent investigators abroad.

Trained manpower and facilities are just beginning to become available in sufficient quantity and quality to mount a full-scale attack on these problems. Joined together in more efficient types of research organizations and provided with all the resources of new tools and techniques, investigators will be able to carry out the most highly refined and productive research yet imagined.

The budgetary requirements for the future depend very largely on the present status of medical knowledge, which will be the base for new advances, and on the decisions made today for the training of manpower and the construction of facilities.

The Committee does not agree with those who hold that further expansion of our medical research effort is impossible because of a shortage of manpower and facilities. In view of the opportunities which now open before us and the greatly magnified potential productivity noted above, it believes that a remarkable increase in medical research activity would be possible with the manpower now available.

If the efforts at recruitment of young men and women into the medical sciences are intensified, as recommended by this Committee, if the medical educational capacity of our country is expanded so that we can increase the

number of physicians and dentists trained, and if the number of Ph. D. candidates in the basic sciences continues to rise, the manpower available in the future will permit such an increase in the breadth and depth of the stream of medical research that the chances of finding answers to some of our most pressing disease problems will be immeasurably improved.

The Committee therefore foresees the need for much larger appropriations in the future to support a greatly expanded research effort in the attack on the major problems of disease and disability confronting us today. These larger appropriations will come from both Federal and non-Federal sources, and in this partnership Federal funds must supplement those of the States, industry, and private philanthropy as may be necessary to accomplish the task. The expansion of Federal support should not be limited by, or paced by, the rate of growth of non-Federal sources of funds.

The cost of this program will seem substantial compared with expenditures in the past, but will be insignificant in consideration of the return on this investment. The Committee is confident that the projected growth of our economy will allow us to meet the needs of medical research without appreciable strain and that support of the program proposed in this report will be met by "brave men and brave dollars."

Given the determination and the funds, the manpower can be trained and the facilities can be constructed.

The Congress should, therefore, be prepared to support a dynamic program of medical research which will expand as rapidly as the men and ideas become available.

PART A.—PAST AND PRESENT PROGRAM OF FEDERAL SUPPORT OF MEDICAL RESEARCH

Chapter I

ADEQUACY OF FEDERAL SUPPORT OF MEDICAL RESEARCH

A consideration of the adequacy of support for medical research can only be undertaken in relation to need. When one reviews the remarkable improvement in the health and longevity of the American people which has been achieved through medical research since 1900, one questions how much faster this progress could have been achieved if more generous support had been available at a time when knowledge of disease which we take for granted today was waiting to be discovered.

Examples of the contributions of medical research during this period will be mentioned in the next section of the report, but at this point it is pertinent to note that the average life expectancy at birth was increased from 49.2 years in 1900 to 69.6 years in 1956, a gain of 20.4 years (table 1). This has resulted primarily from the conquest of most of the communicable diseases in all age groups and a great decrease in other causes of infant mortality.

The spectacular advances of the first half of this century are now reflected in a great shift in emphasis in medical research from the infectious diseases to the chronic, metabolic, and degenerative diseases and to cancer.

We are now confronted for the most part by the medical problems of the older age group, which has been so greatly increased in numbers. These problems are in many ways more complicated than those of the infectious diseases. It is noteworthy that between 1900 and 1956 the life expectancy for those reaching age 60 increased only 2.7 years, and for those reaching age 70, only 2.0 years. Moreover, there has been essentially no change in life expectancy for any age group in the last 3 years for which figures are available (table 1). This suggests that, although we have essentially eliminated many causes of death and disability in the younger age group, we have made little progress against the main causes of death after age 60, cardiovascular disease and cancer. Despite the great advances in our knowledge of the nature and treatment of these disorders, we have not learned enough to keep pace with environmental factors, largely unknown, which seem to be responsible for an increase in their incidence.

TABLE 1.—*The average remaining lifetime in years at specified ages, 1900–1902, 1919–21, 1939–41, 1956, 1957, and 1958* [1]

Age	1900–1902	1919–21	1939–41	1956	1957	1958 (estimate)
0	49. 24	56. 40	63. 62	69. 6	69. 3	69. 5
5	54. 98	57. 99	62. 49	66. 7	66. 5	66. 7
10	51. 14	53. 79	57. 82	61. 9	61. 6	61. 8
20	42. 79	45. 30	48. 54	52. 3	52. 0	52. 2
30	35. 51	37. 68	39. 67	42. 9	42. 7	42. 8
40	28. 34	30. 08	31. 03	33. 7	33. 4	33. 5
50	21. 26	22. 50	22. 98	25. 1	24. 8	24. 9
60	14. 76	15. 54	15. 91	17. 5	17. 3	17. 3
70	9. 30	9. 74	10. 00	11. 3	11. 2	11. 2

[1] For 1900–1902, data are for 10 States and the District of Columbia; for 1919–21, data are for 34 States and the District of Columbia; for 1939–41, 1956, 1957, and 1958, data are for the entire continental United States.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service. *Summary of Health and Vital Statistics*, PHS Pub. No. 600 (June 1958), p. 25.

It is a curious fact that, in spite of our great progress in the fight against disease, the needs and opportunities of medical research of which we are aware today are even greater than those which were recognized 20 years ago. This is not difficult to explain. We have greatly increased the number of trained scientists working in medical research who can appreciate the new problems revealed by the solution of old ones and by the recent additions to our store of medical knowledge. During the past 20 years, we have developed facilities in which research can be carried out more effectively and with greater refinement than ever before. New tools developed through the advances in knowledge in the basic sciences are providing new possibilities for research of almost limitless dimensions. Our knowledge of living organisms has been immensely extended, and we are now approaching a relatively clear understanding of the most fundamental biochemical and physical nature of the life processes in health and disease. Our horizons in the direction of the infinitely small have been enlarging quite as rapidly as our horizons in the direction of the infinitely big. Electronmicroscopy has revealed a strange new world of structure to be correlated with function, and the introduction of X-ray microscopy will discover still smaller wonders which we must learn to understand. The basic sciences are merging in a unified attack on many problems such as the mechanisms of enzyme and hormone actions, the physicochemistry of chromosomes and genes as a basis for heredity and the structure and function of ribonucleic acid and deoxyribonucleic acid which seem to control the life processes in body cells and micro-organisms.

Such major extensions of our basic knowledge, the development of new tools and techniques and the availability of trained scientists to use them, are enabling us to make new approaches to the problems of disease. Through continued research, and at a rate which in large measure will be determined

by the amount of support provided, we shall make progress toward the prevention, alleviation, and cure of many of the disease conditions of greatest concern to mankind.

Support of Medical Research

To determine whether the support of medical research has been and is now sufficient in relation to the research needs and opportunities existing at any particular time is primarily a matter of judgment. The total national expenditures for medical research have been increasing fairly steadily over the past 20 years, as shown in table 2, from $45 million in 1940 to $715 million in 1960 (estimated). During this period Federal support of medical research has increased from $3 million in 1940 to $380 million in 1960 and its percentage of the total has risen from 7 to 53 percent.

TABLE 2.—*Total, Federal, and non-Federal medical and health-related research expenditures, 1940–60*

[In millions]

	Total national medical research	Non-Federal medical research	Federal medical research	Federal as percent of total national medical research
1940	$45	$42	$3	7
1947	88	60	28	32
1950	148	88	60	41
1953	203	107	96	47
1954	225	118	107	48
1955	240	122	118	49
1956	285	150	135	47
1957	397	211	186	47
1958 (estimated)	491	264	227	46
1959 (estimated)	587	296	291	[1] 50
1960 (estimated)	715	335	380	[1] 53

[1] Data on Federal expenditures are available at beginning of fiscal year; data on non-Federal expenditures cannot be obtained until after the end of the fiscal year. Therefore, estimates for 1959 and 1960 may overstate the Federal share.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (January 1960).

The Federal support for medical research has been provided primarily through the Department of Health, Education, and Welfare. Estimated medical research expenditures by Federal agency for fiscal years 1957–60 are shown in table 3. It will be noted that in fiscal year 1960, the Department of Health, Education, and Welfare is expected to spend $314.2 million or 82 percent of the $380 million total, the Department of Defense $29.3 million or 8 percent, the Atomic Energy Commission $18.3 million or 5 percent, and the Veterans' Administration $15.3 million or 4 percent.

TABLE 3.—*Source of medical and health-related research expenditures by Federal agency, 1957–60*

[In millions of dollars]

Agency	1957		1958 estimate		1959 estimate		1960 estimate	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Total	$186	100	$227.2	100	$290.5	100	$379.8	100
Health, Education, and Welfare	138	74	179.7	79	236.3	82	314.2	82
Defense	23	12	23.6	11	24.2	8	29.3	8
Atomic Energy Commission	14	8	13.5	6	16.1	6	18.3	5
Veterans' Administration	11	6	10.0	4	12.9	4	15.3	4
Other [1]			.4	(2)	1.0	(2)	2.7	1

[1] Includes funds from the Federal Aviation Agency, Department of State (ICA), Office of Civil and Defense Mobilization, Tennessee Valley Authority, and Department of Interior in 1958, 1959, and 1960; and from the National Aeronautics and Space Administration in 1960.

[2] Less than 0.5 percent.

Source: U.S. Department of Health, Education, and Welfare, National Institutes of Health, Office of Program Planning, Resources Analysis Section (January 1960).

Have these funds been sufficient to support the men with ideas capable of doing good research and of undertaking the special investigations essential to the specific health missions of those Federal agencies sponsoring medical research?

The Committee finds that the support provided by the Congress over the past 15 years has been substantial and has resulted in a great increase in the size and strength of our medical effort. Many men have received excellent research training, and some fine laboratories have been built and equipped. Medical education, the training of manpower for research, and the quality of medical practice have all been strikingly improved. However, the funds provided have only partially compensated for a large preexisting deficit in the dollar support for medical research. Much more could have been accomplished if greater support had been forthcoming earlier, and the research potential now available is still not receiving sufficient support to make the contribution of which it is capable.

More detailed discussion of areas in which the Committee finds Federal support inadequate will be found in later sections of this report. At this point the Committee would like to emphasize that if we are to utilize the medical research potential of this country to the maximum in a major attack on the dread diseases, if we are really to make the most of the new research opportunities opening up before us, and if we are to gain the greatest advantage from the new tools and techniques now becoming available, we have very definite and urgent needs which must be met as quickly and in as sustained a manner as possible.

For the great advances in medical research that are possible for the future, one of the greatest needs will be the training of many more physicians, dentists, Ph.D.'s, technicians, and paramedical personnel. A much greater support of training programs and fellowships is therefore essential. This will unquestionably require the expansion of our educational capacity in these fields as well as in many others and the construction of medical educational facilities.

The second great need is for improvement and expansion of the facilities within which medical research is carried out. Although Federal funds have helped greatly, especially through the Health Research Facilities Construction Act and the Hill-Burton program, to renovate and build excellent laboratories and hospitals, many more are needed. New developments in equipment and instrumentation promise a tremendous increase in the dimensions of research but will require new types of facilities and the establishment of special centers in which such work can be undertaken. These centers will be costly, but their availability will extend immeasurably the effectiveness of the individual investigator.

Our support of health research facilities construction is today much too small in proportion to the need and to the funds being expended for research. This area represents one in which the Committee finds the funds appropriated to be quite insufficient.

A third area in which the funds appropriated have proved inadequate is in the support of research possibilities. Some of the greatest deficits and wasted opportunities for medical research exist in the armed services and the Veterans' Administration and are caused almost entirely by budgetary limitations. For the Public Health Service, too, larger appropriations are needed. Although in the case of the National Institutes of Health, the funds appropriated for fiscal year 1960 approximated the needs for some of the institutes, they were inadequate for others, and a total of $23 million in approved but unpaid applications for research grants, training grants, and fellowships is anticipated by the end of fiscal year 1960. The continuing growth of medical research in this country will make the present level of support for all Institutes grossly insufficient for the coming year.

In the program for the future, State, industrial, and private sources should be encouraged to contribute as much as possible. However, this Committee believes that these sources cannot be expected to provide even half of the support which will be required, and that the Federal Government should supplement their efforts to whatever extent may be necessary.

Conclusion:

The funds appropriated by the Congress for the support of medical research, although substantial, are still not sufficient to assure the full utilization of the Nation's potential for an attack on the dread diseases, and the present level of support is far from adequate to permit the great advances essential for the future.

Recommendation:

ROLE OF FEDERAL GOVERNMENT IN SUPPORT OF MEDICAL RESEARCH

The Federal Government should supplement private, industrial, and State funds, as may be necessary, to support medical research on the scale required to carry out a determined attack on major health problems. The magnitude of Federal support should be neither limited by, nor paced by, the rate of increase of non-Federal sources of support.

Chapter II

EFFECTIVENESS OF UTILIZATION OF FEDERAL FUNDS APPROPRIATED FOR MEDICAL RESEARCH

The effectiveness of a health program can be measured by many yardsticks. To a parent agonized by the illness of a child, the effectiveness of a medical procedure has a personal and immediate significance. To the humanitarian, the saving of life and the alleviation of human suffering are objectives so noble as to be beyond price. Such humane considerations have largely prevailed in mobilizing funds for medical research in the past. The great advances in medicine which have occurred as a result of our health programs in the modern era can also be evaluated in numerical terms and by financial calculations, and we can assess the effectiveness of medical research in relation to the effort and cost of the program.

The history of medical research provides many examples to illustrate the economic importance of controlling disease. The great plague of London, according to Dafoe, took a toll of 200,000 lives, caused the nearly complete evacuation of the city, and brought all overseas trade to a complete standstill for more than a year. Mosquito control procedures leading to the control of yellow fever made possible the building of the Panama Canal. In still more modern times, the control of infectious diseases and the reduction of infant mortality have provided the manpower by which our war efforts and our economic expansion have been supplied.

More direct statistics can be provided. The cancer cure rate has changed during the last few years from 1 in 4 to 1 in 3. Of the 450,000 new patients stricken each year, 150,000 are now saved annually through application of our recently acquired research knowledge. The annual loss to our economy from cancer has been estimated in 1958 at $12 billion. Against these figures, the $56 million invested in research by the Cancer Institute during that year seems small indeed and appears to have earned remarkable dividends.

Many other examples could be cited from which the economic advantages accruing from medical research could be estimated. Tuberculosis, once the great white plague, is today a treatable disease, the death rate from which has dropped 80 percent in the last 15 years. Retrolental fibroplasia, a disease causing blindness at birth, is now almost abolished. The number of cases of venereal diseases has been greatly reduced, although recently there has been an upswing correlated with the reduction of funds for control.

From all of the statistics available, it has been estimated that 1,800,000 lives have been saved in the last 15 years as a result of our health research program. The annual earning capacity of these people was $3.6 billion in 1958, and their tax contribution to our Federal Government $623 million. Judged from any or all of these figures or analyses, no conclusion is possible except that the agencies supporting medical research have operated with remarkable effectiveness.

The National Institutes of Health, to which Congress has entrusted the chief responsibility for the disbursement of funds for medical research, has developed an extremely successful system of review and approval of applications for research grants, training grants, and fellowships. This plan, relying on close supervision by the scientists themselves, has operated in such a manner as to win the admiration and confidence of the entire scientific community.

In any program of this magnitude some waste is inevitable. Since each research project is in a sense a gamble on the brains and skill of the investigator, not all research projects have been productive or brought to successful conclusions. The research advisers are human and not infallible in their judgments, but the Committee believes that the funds have been expended as wisely as human judgment would permit.

The administration of the National Institutes of Health program has been in the hands of unusually competent and dedicated individuals who have taken great care to avoid any interference with the institutions in which the research is carried out or with the individual investigators.

The Committee would like to commend the National Institutes of Health for the flexibility and adaptability it has shown in meeting the problems encountered in the development of its present program, and in discarding methods of operation which have proved inefficient or impractical. It is confident that the National Institutes of Health will hold its administrative mechanisms under continuous study to assure that they remain responsive to new requirements.

In the dynamic program of medical research which the Committee foresees for the future, it believes that the excellent system of support of research grants to individual investigators through their schools, after central review by committees of experts in the field, will remain the most important part of the program.

Research funds, however, must be provided to an increasing degree under terms and conditions which will permit scientists still broader latitude to pursue their own ideas and assure them greater stability of support.

New opportunities are developing for a large-scale multidisciplinary attack on disease problems, and these will have the result of uniting the efforts of many investigators into large comprehensive collaborative research programs or into clinical research centers. These will require a different type of program evaluation from the individual research grants, but should eventually simplify the problems of central review.

Efficiency in the allocation of increased research funds and their effective use can be achieved through new administrative patterns, some now apparent and others to be evolved.

One of the major sources of difficulty in the wise expenditure of funds for new programs by the National Institutes of Health has unintentionally been created by the requirement that the funds be allocated within the fiscal year of their appropriation. Because of the problems this restriction imposes on sound planning and the recruitment of appropriate administrative personnel, liberalization of the time limit should be considered and would permit more efficient utilization of the funds.

Conclusion:

Considering the program as a whole, the funds appropriated by the Congress for the support of research on major disease problems have been efficiently spent in the best interests of the research for which they were designated.

Recommendations:

(1) NEW ADMINISTRATIVE PATTERNS FOR SUPPORT OF RESEARCH

For the effective allocation of the larger funds which will be required in the future, new administrative patterns for the support of research must be developed. These will include institutional grants, program grants, and large grants to clinical research and special resource centers. **(See p. 68.)**

(2) METHOD OF APPROPRIATION FOR NEW PROGRAMS

In order to assure the highest efficiency of utilization of funds for new programs and those requiring a long leadtime for effective planning, Congress should give serious consideration to granting funds on a 2-year basis (or more) when making appropriations for such purposes.

Chapter III

IMPACT OF THE EXPANDING FEDERAL PROGRAM IN SUPPORT OF MEDICAL RESEARCH

A. EFFECT ON MEDICAL SCHOOLS

The Federal program in support of medical research has given the medical schools of the country the opportunity to build up their research and teaching potential to a strength which could scarcely be imagined 15 years ago. Facilities have been improved and the number and quality of teachers in academic medicine have greatly increased. However, the full development of the present medical education capacity of the country and its expansion to meet the demands of our rapidly expanding population for additional trained manpower—teachers, investigators, and practitioners—in the future cannot be achieved until Federal help of other kinds also is forthcoming. As recommended in the Bane Report, these include: (1) health educational facilities construction, (2) payment of the additional costs of research, (3) institutional research grants, (4) an increase in training programs with greater emphasis on preparation for academic careers, and (5) the creation of additional stable academic career opportunities in medicine.

The Committee is deeply concerned that the problem of aid to medical schools should receive prompt attention. It is fully cognizant of the urgent educational needs at all levels in our country. It believes, however, that failure to produce doctors in proportion to our rapidly expanding population would court disaster in both the military and civilian sectors of our economy and would pose a threat to the national health and welfare which no citizen will tolerate.

The Committee recognizes that improved utilization of space and teaching time may permit some increase in the annual number of graduates without significant sacrifice in quality of training. It is convinced, however, that such measures will never answer the whole problem in more than a makeshift fashion and that a major program of health educational facilities construction is absolutely inescapable.

1. *Construction of Health Educational Facilities*

The long leadtime required to develop new medical schools and the greater cost of expansion of existing medical educational facilities as compared with expansion of facilities for other areas of education, require prompt and energetic action and careful planning.

The Committee considers the future growth of the country's medical educational capacity to be of such great importance that it urges immediate implementation through the Department of Health, Education, and Welfare, of the recommendations of the Bane Committee. In this effort the maximum encouragement should be given to the participation of local and State sources in the planning and financing of medical educational facilities.

The present group agrees with the Bane Committee that new health educational facilities should be built in close relationship to colleges or universities, either public or private, but preferably those with strong basic science departments. Furthermore, serious consideration should be given to those areas in which there is a great need for more physicians but a lack of opportunity for medical education and to those areas with the financial capacity to support the continuing operation of a medical school.

The Bane Committee estimated that, in order to maintain the present physician/population ratio of 141/100,000 (including osteopaths), we must increase our annual number of graduates from the 1959 level of approximately 7,400 physicians (6,900 M.D. and 470 D.O.) to a level of 11,000 by 1975 (table 4). Such an increase of 3,600 graduates per year can be achieved by (1) an expansion of existing medical schools, (2) the construction of new 2-year schools whose graduates can move into vacancies in the third-year classes of existing schools, and (3) the construction of new 4-year schools.

TABLE 4.—*Estimated number of physicians (M.D. and D.O.) in the United States, graduates at present production rates and the number required to maintain 1959 physician/population ratio: 1959–75*

Year	Graduates and physicians at presently planned rate			Graduates and physicians required to maintain 1959 physician/population ratio of approximately 141/100,000	
	Graduates	Total physicians	Number of physicians per 100,000 population	Graduates	Total physicians
1959	7,400	249,100	140.7	7,400	249,100
1960	7,500	253,400	141.4	7,500	253,400
1965	7,900	275,000	140.4	8,100	275,100
1970	7,900	294,900	137.9	9,600	299,000
1975	7,900	[1] 312,800	133.0	11,000	330,000

[1] Exclusive of physicians in military and other Federal services and assuming that the number of foreign graduates who are licensed to enter practice in this country will level out at 750 a year.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, *Physicians for a Growing America: A Report of the Surgeon General's Consultant Group on Medical Education* (October 1959).

It is encouraging that a careful canvass of the prospects of the existing medical schools by the Association of American Medical Colleges, reported in a recent article by Powers, Darley, and Oppermann,[1] reveals that if these schools

[1] Lee Powers, Ward Darley, and K. C. Oppermann, "National Goals for the Construction of Medical School Facilities," *Journal of Medical Education*, vol. 35, No. 2 (February 1960), pp. 108–119.

can obtain the financial help they need over the next 5 years to carry out required construction as well as to renovate and modernize their facilities, they will be able to increase their enrollment by 1,060 students. The cost of this program is estimated at $324.5 million, of which $288.6 million would represent new construction, mainly by the older schools.

The Bane Committee and the Association of American Medical Colleges study also found that last year there were 760 vacancies in third-year classes in medical schools of the United States owing to dropouts in the first and second years. If enough 2-year schools were built to yield 760 graduates per year who would be eligible for transfer to the 4-year schools and if the graduating classes from these schools averaged 50 students, a minimum of 16 such schools would be needed to fill the present number of vacancies in third-year classes. The average cost of building a 2-year school is estimated at $7–8 million. If 16 universities which do not now have medical schools could be persuaded to establish 2-year schools, this could be done for approximately $128 million. The Association of American Medical Colleges and the Council on Medical Education and Hospitals of the American Medical Association are encouraging universities to undertake such programs.

This still leaves a deficit of 1,800 medical school graduates who will be needed by 1975 to maintain the present physician/population ratio. If 18 new 4-year medical schools with graduating classes of 100 each were built at an average cost of $30 million per school, the total requirement for these new schools would be $540 million.

The entire cost, spread over the next 10-year period, for the expansion of existing schools ($325 million), the construction of new 2-year schools ($128 million), and of new 4-year schools ($540 million) would be $993 million.

The point of this rough calculation is to highlight an interesting computatation also made by the Association of American Medical Colleges in the same study to the effect that in the years 1948–58 this country spent $1,633.6 million for construction in the interests of medical schools and their affiliated institutions (table 5). Of this total, private and State sources of funds contributed $1,415.3 million, or 87 percent, and the Federal Government only $218.3 million, or 13 percent. The 10 new 4-year medical schools built during that period cost $234 million (or approximately $23.4 million each) of which $22.8 million, or less than 10 percent was contributed by the Federal Government. The rest of the $1.6 billion was devoted to expansion and modernization of existing schools, including four 2-year schools.

TABLE 5.—*Total expenditures for construction of U.S. medical schools (Puerto Rico included) and their affiliated institutions since 1948*

[In millions of dollars]

Type of facility	Expenditures not involving matching funds	Expenditures involving Federal matching funds	Total expenditure for construction	
Educational and research	222.7	318.4 [1] (80.6)	541.1	781.6 (114.7)
Medical school-owned hospitals	112.9	127.6 [1] (34.1)	240.5	
Affiliated hospitals	340.6	467.9 [1] (94.0)	808.5	
Institutions other than hospitals used for teaching and research [2]	10.7	32.8 [1] (9.6)	43.5	
Total	686.9	[3] 946.7 [1] (218.3)	1,633.6	

[1] (Federal funds involved.)

[2] Many of these institutions are not owned and operated by the medical school (i.e., research centers, health departments, etc.).

[3] Note for every $1 of Federal funds, private, State, and university sources have expended $3½.

Source: Association of American Medical Colleges. *The Journal of Medical Education*, vol. 35, No. 2 (February 1960).

The estimated construction need of approximately $1 billion for medical schools alone over the next 10–15 years to maintain our physician/population ratio at its present level therefore does not seem unreasonable and could be achieved at an average national expenditure of approximately $100 million per year.

It should be emphasized that this is probably a conservative estimate. Inflation and the greater cost of new types of equipment may raise the cost of building a medical school to considerably more than the figure of $30 million used above. Nevertheless, this approximation gives some indication of the dimensions of the task before us and the amounts involved in creating the necessary facilities.

The comparable figures are not readily available for dental schools and schools of public health, but it would seem that for these schools also, the construction needs for the decade ahead are not likely to exceed very greatly those for the decade just past.

The present rapid growth of our population confers an urgency on the new construction of health educational facilities that cannot wait for the uncertain pace of non-Federal initiative in this field. Moreover, the Committee has heard testimony that many schools are finding increasing difficulty in obtaining matching funds. Therefore, the Committee believes that, although a large portion of the funds required will be forthcoming from State, private, and industrial sources, the Federal share in the proposed new construction of schools

of medicine, dentistry, and public health will have to be considerably greater than in the past.

The Committee therefore urges that funds be authorized and appropriated in this session of Congress to initiate a long-term program in support of the Federal share of health educational facilities construction which will be required to assure an ample production of doctors for research, as well as for teaching and practice, in the future.

Recommendation:

CONSTRUCTION OF HEALTH EDUCATIONAL FACILITIES

(See pp. 98–99.) The Federal Government should supplement the efforts of the States and of private sources to meet the construction needs of our public and nonprofit medical, dental, and public health schools by appropriating funds on a matching basis for:

(*a*) Improvement and/or expansion of existing schools of medicine, dentistry, and public health;

(*b*) New 2-year schools of basic medical sciences;

(*c*) New 4-year schools; and

(*d*) The necessary teaching hospitals.

2. *Payment of Full Costs of Research*

A major deterrent to the further expansion of medical research in the United States today is the failure of granting agencies, and especially the National Institutes of Health, to pay the full costs of the research they support. The difference between the actual costs and the percentage paid by the granting agency has had to be met from the institution's own funds. Since most schools of medicine, dentistry, and public health are having difficulty financing the rapidly mounting costs of medical education, funds for research can be provided only at the expense of other programs, activities, and functions which are also essential to the general missions of these institutions. The burden of the cost of research on the schools has reached such serious proportions that some measure of relief has become the most important single need in the minds of medical educators and administrators.

The expenditures for separately budgeted research in medical schools and universities in this country have been rising rapidly since World War II. For medical schools only, the figures recently released by the National Science Foundation,[2] based on its survey covering 80 medical schools for the year 1957–58, have shown more than a twofold increase since its last survey, from $45.3 million in 1953–54 to a total of $105.5 million in 1957–58, and a sixfold increase since 1947–48 when the level was $17.1 million.

[2] National Science Foundation, *Reviews of Data on Research and Development*, No. 3 (April 1957) and No. 17 (January 1960).

Expenditures for separately budgeted research in medical schools

	Million
1940–41	$3.5
1947–48	17.1
1953–54	45.3
1957–58	105.5

The distribution between sources of support is given in table 6. It can be seen that the research supported by the Department of Health, Education, and Welfare (chiefly by the National Institutes of Health) represented 48.6 percent of the total in 1957–58. The policy followed by the National Institutes of Health in reimbursement for the costs of research, therefore, has a major effect on the medical schools.

TABLE 6.—*Expenditures of U.S. medical schools for separately budgeted research by source of support, 1953–54 and 1957–58*

[In millions of dollars]

Source	Amounts		Percentage distribution		Percentage increase
	1953–54	1957–58	1953–54	1957–58	
Department of Health, Education, and Welfare	$14.2	$51.3	31.3	48.6	261
Other Federal	8.6	13.6	18.8	12.9	58
Non-Federal	22.6	40.6	49.9	38.5	80
Total	45.3	105.5	100.0	100.0	133

NOTE.—Detail may not add to totals due to rounding.

Source: Association of American Medical Colleges. *Datagrams*, vol. 1, No. 12 (June 1960). National Science Foundation.

Total indirect costs of separately budgeted research carried out in medical schools were calculated according to the formula most generally employed by the Department of Defense and other Federal agencies during that period, commonly called the "Blue Book Formula."[3] These amounted to $22.5 million in 1957–58 (table 7). Of this sum $10 million was paid by the sponsoring agencies and $12.5 million by the medical schools.

[3] Sec. XV, "Contract Cost Principles," Armed Services Procurement Regulations.

TABLE 7.—*Support of medical school indirect costs*

[Data based on Bluebook formula]

[In millions of dollars]

Source of payments	Federal		Non-Federal		Total	
	1953–54	1957–58	1953–54	1957–58	1953–54	1957–58
Sponsoring agency	[1] $2.4	[1] $7.6	$0.9	$2.4	$3.3	$10.0
Medical schools	5.1	6.6	4.0	5.9	9.1	12.5
Total	7.5	14.2	4.9	8.3	12.4	22.5

[1] NIH allowance for indirect costs increased during this period from 10 to 15 percent.

Source: Association of American Medical Colleges. *Datagrams*, vol. 1, No. 12 (June 1960). National Science Foundation.

If the above relationship were still to hold when the national expenditures for medical research reach the $1 billion mark, as now seems likely before 1965, this would mean that the medical schools would have to invest $32 million, or $19 million more than in 1957–58, toward defraying indirect costs.

Fortunately, changes have been authorized in the policies of some Federal agencies since 1957–58. All three branches of the armed services and the National Science Foundation have recently been permitted to recognize more realistically the high cost of research to the institutions in which it is carried out. They are now allowing payment of the costs of research on research grants up to 20 percent of total direct costs, or actual costs based on the most recent audit by a Federal agency, whichever is lower. Full costs are uniformly paid on contract research. After July 1, 1960, all Government agencies that sponsor research and development under grants and contracts in educational institutions *except the National Institutes of Health* are expected to adopt the principles for costing research set forth in the Bureau of the Budget Circular No. A–21.

The National Institutes of Health is thus the only major Federal agency supporting medical research today through grants which does not pay either 20 percent of the direct costs or the full costs of research as determined by a cost analysis formula. This seems unfair discrimination against the National Institutes of Health as a source of support.

In 1957–58, the average of indirect costs of federally sponsored research for 80 medical schools as calculated by the "Blue Book Formula" was 25.1 percent (table 8) with a variation from less than 18 to more than 45 percent. The average has presumably increased still more since 1957–58 and the 20 percent allowance by the armed services and the National Science Foundation would seem to be inadequate in most cases. If a cost formula is used, the preferred one is that now advocated by the Bureau of the Budget in Circular No. A–21.

TABLE 8.—*"Blue-Book rate" of indirect cost as percent of research operating expenditures, U.S. medical schools, fiscal year 1958*

[Dollar data in thousands of dollars]

	Size category (indirect cost as percent of research operating expenditures)	Number of medical schools	Federally sponsored research operating expenditures	
			Amount	Percent of total
Grand total		80	$64, 866	100. 0
Total		74	63, 349	97. 3
	Less than 18.0	8	2, 002	3. 1
	18.0 to 19.9	3	837	1. 3
	20.0 to 24.9	30	28, 428	43. 8
	25.0 to 29.9	15	16, 617	25. 6
	30.0 to 34.9	8	8, 759	13. 5
	35.0 to 39.9	4	2, 410	3. 7
	40.0 to 44.9	4	1, 800	2. 8
	45.0 to 49.9	2	2, 278	3. 5
	50.0 or more			
Overall weighted average percent of indirect cost for all 80 medical schools	25.1			

NOTE.—Detail may not add to totals due to rounding.
Source: National Science Foundation, Office of Special Studies.

Thus the Committee is convinced that the 20 percent allowance for the National Science Foundation and the armed services is still not high enough to cover the costs of research in the majority of schools and research institutions. It believes that payment of the full costs of research is essential to the further development of the research effort of the Nation.

Recommendations:

PAYMENT OF FULL COSTS OF RESEARCH

The National Institutes of Health should be authorized to allow a realistic amount for the costs of research directly related to the program supported. This could be provided in either of the following ways, listed in order of preference:

(1) Full costs as determined by a cost analysis formula (such as that proposed in the Bureau of the Budget Circular No. A–21), or

(2) Twenty-five percent of total direct costs except for those institutions which have formally established lower rates on the basis of audit by a Federal agency. (The average figure for medical schools audited under the "Blue Book Formula," reported to the National Science Foundation in its 1957–58 survey, was 25.1 percent.)

3. *Institutional Grants*

The general effect of the Federal program in support of medical research on the medical schools and research institutions of the country has been extremely beneficial and has enabled them to develop facilities and strengthen their faculties in a truly remarkable manner.

There is concern, nevertheless, that the Federal program may produce some distortion in the teaching and research programs of medical schools and research institutions unless they are provided funds with which they can balance their research programs. The support of investigators by a Federal agency on an individual project basis, after review and approval by committees of experts, has been outstandingly successful and has been carried out with great wisdom and flexibility. This support, however, comes to the schools and research institutions through requests of individual investigators without regard for the overall plans of the institution and with conditions attached which may not fit into its program. This can lead to an uneven development which may not be in the best interests of the institution as a whole.

The institutions are experiencing increasing difficulty in meeting the rising costs and mounting pressures involved in the performance of their teaching, research, and service functions. Although they need to expand their faculties, they cannot establish and maintain enough rewarding full-time faculty positions with tenure to accommodate senior research scientists at the completion of their long periods of training. They often have difficulty in supporting initial pilot research in new areas or by new and untried investigators who are not yet ready to send in projects for review by national advisory groups. They cannot manage out of their general operating funds to acquire and maintain the elaborate new types of equipment and research resources which are needed for the medical research of today and tomorrow, or to maintain adequately libraries, animal resources, and general research services.

In the face of the many pressures to which they are now subjected, these institutions are finding it almost impossible to maintain a desirable balance in the research and teaching programs of their various departments and to pursue their own research goals with continuity of purpose.

The National Institutes of Health has recognized these problems and has the support of the Administration in proposed legislation which, if passed, would permit a certain percentage of the total National Institutes of Health appropriation for research grants to be administered as grants to "public and nonprofit universities, hospitals, laboratories, research institutes and other institutions for the general support of their research and research training programs."

Such grants, by returning to the institutions a greater responsibility for the administration of research money, and permitting its use to build up the general research facilities of the schools, to establish more research faculty positions with tenure, and to support research in consideration of the specific needs and interests of the institution, would greatly strengthen the role of the institutions in administering their research programs under conditions and in directions of their own choice. Decisions involving purely local matters, such as the selec-

tion of part-time research fellows and recipients of postsophomore grants, could be left to the institutions. The resulting decentralization would lessen the burden of central review and minimize Federal administration.

The National Institutes of Health has proposed that institutional grants be made on a formula basis with a basic amount to all schools and an increase above that sum dependent on the research capacity and current research load of each institution and the outside funds it is able to attract. This should be done in a way to assure help for the less well-financed schools.

The initial proposal is to limit to 15 percent the proportion of the research grant appropriation which can be awarded as institutional grants. This Committee believes it is unwise to impose a limitation. Although it feels that individual research grants should continue to represent the major part of the grant program, it anticipates that the institutional grants will prove exceedingly valuable and that a larger share of the total should probably be so allocated in the future. It would, therefore, recommend that no ceiling be imposed on the percentage devoted to institutional grants and that this decision be left to administrative determination on the basis of experience.

Recommendation:

INSTITUTIONAL GRANTS

The Public Health Service should be permitted by law to make institutional grants, upon recommendation of the appropriate council of the National Institutes of Health, to public or nonprofit universities, hospitals, laboratories, research institutes, and other institutions, for the general support of their medical research and research training programs.

The proposed limit on such grants to 15 percent of the total research grant appropriation should be removed, and the relation of institutional grants to the total research grant program should be administratively determined. The current highly effective project grants should continue as a major method for the support of research.

4. *Increase in Training Programs*

Central to any consideration of the expansion of our medical education capacity to meet the demands of our increasing population and the production of more teachers, investigators, and practitioners, is the need for additional highly trained manpower. In order to staff the basic science departments of the colleges, universities and medical, dental, and public health schools of the future, we shall urgently require increased numbers of basic scientists, physicians, dentists, and public health officers. These can be provided only by increasing the magnitude and depth of our fellowship and training programs at all levels, with greater emphasis on preparation for academic careers. (See pp. 69–70, 96.)

5. *Creation of Additional Opportunities for Stable Academic Careers*

In spite of our great need for more doctors in teaching and research, and the large number of promising young investigators coming out of the training programs, the fact is that most of the schools cannot find the funds to increase their faculties. Faced with urgent and continuing demands for teaching personnel, they find it especially difficult to provide funds for research professorships which have proved of remarkable value wherever they have been established.

The Committee believes that a greater number of stable academic career opportunities in research must be provided for the future: (1) to permit a greater number of outstanding investigators to make their maximum contribution to the research effort; (2) to help create a stimulating spirit of inquiry in our medical schools and to give inspiration and challenge to medical students, house officers, and younger investigators; and (3) to persuade promising young investigators to remain in academic medicine. (See p. 96.)

B. EFFECT ON MEDICAL PRACTICE

Much heat has been generated in argument as to whether the Federal program in support of medical research has had an adverse effect on medical practice and patient care. The Committee understands the basis for this concern but believes it to be unjustified.

It is true that the number of practicing physicians per 100,000 population has decreased in the United States from 108/100,000 in 1940 to 91/100,000 in 1958 (table 9). There are many reasons for this, and they do not necessarily add up to a detrimental effect on medical care.

TABLE 9.—*Ratio of doctors of medicine and of doctors of medicine in private practice to the population of the United States, 1931–59*

Year	Population [1] (in thousands)	Total number of M.D.'s	Number of M.D.'s in private practice	Ratio per 100,000 Population	
				All M.D.'s	M.D.'s in private practice
1931	124, 149	156, 406	134, 274	126. 0	108. 2
1940	132, 122	175, 163	142, 939	132. 6	108. 2
1949	149, 188	201, 277	150, 417	134. 9	100. 8
1957	171, 198	226, 625	155, 827	132. 4	91. 0
1958	174, 064	230, 600	[2] 158, 261	132. 5	90. 9
1959	177, 103	235, 000		132. 7	

[1] U.S. Department of Commerce, Bureau of Census. *Current Population Reports: Population Estimates*, Series P-25, Nos. 213 and 187. Figures include Armed Forces overseas but exclude Alaska and Hawaii.

[2] American Medical Association. *American Medical Directory, 1958*, p. 13, table 3.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Public Health Methods. *Health Manpower Source Book: Section 9, Physicians, Dentists, and Professional Nurses*, PHS Pub. No. 263, sec. 9. Washington: U.S. Government Printing Office, 1959.

The total number of physicians per 100,000 population has remained constant and the decrease in the proportion going into practice is counterbalanced by an increase in the percentage engaged in hospital service and in part- or full-time teaching and research (table 10). Thus the number in hospital service has increased from 14,000 in 1940 to 36,000 in 1957, the number in full-time teaching, research, public health, industrial medicine, and military service increased from 8,100 in 1940 to almost 24,000 in 1957, and the total in both groups in 1959 has presumably continued to rise.

TABLE 10.—*Number of physicians (M.D.) in the United States and ratio to population, by type of practice: 1931–59*

Type of practice	1931	1940	1949	1957	1959
	Number of physicians				
Total	156, 406	175, 163	201, 277	226, 625	236, 089
Private practice	134, 274	142, 939	150, 417	155, 827	160, 592
General practice and part-time specialty	112, 116	109, 272	95, 526	81, 443	81, 957
Full-time specialty	22, 158	33, 667	54, 891	74, 384	78, 635
Not in private practice	16, 151	22, 351	41, 160	60, 137	65, 180
Hospital service	9, 700	14, 209	24, 887	36, 371	39, 730
Teaching, research, public health [1]	2, 900	3, 349	3, 737	7, 168	7, 931
Federal Government	3, 551	4, 793	12, 536	16, 598	17, 519
Retired	5, 981	9, 873	9, 700	10, 661	10, 317
	Physicians per 100,000 population				
Total	126. 0	132. 6	134. 9	132. 4	133. 3
Private practice	108. 2	108. 2	100. 8	91. 1	90. 7
General practice and part-time specialty	90. 3	82. 7	64. 0	47. 6	46. 3
Full-time specialty	17. 9	25. 5	36. 8	43. 5	44. 4
Not in private practice	13. 0	16. 9	27. 6	35. 1	36. 8
Hospital service	7. 8	10. 8	16. 7	21. 2	22. 4
Teaching, research, public health	2. 3	2. 5	2. 5	4. 2	4. 5
Federal Government	2. 9	3. 6	8. 4	9. 7	9. 9
Retired	4. 8	7. 5	6. 5	6. 2	5. 8

[1] Includes also industrial and insurance medicine and other nonprivate practice.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Public Health Methods.

This change in distribution may be in part attributed to the great increase in medical knowledge to be assimilated, to the increasing trend toward specialization and the longer period of training required by the specialty boards, and to the increased interest of young physicians in research and their realization that a continued relationship with teaching and research will permit them to practice better medicine. The larger number of opportunities for careers in teaching and research which exist now as compared with 20 years ago, and some improvement in the incomes available in academic medicine, have also been important factors.

It should be noted that some of the training programs of the National Institutes of Health have increased the numbers of specialists in certain fields which were poorly supplied before.

The relative decrease in the number of practicing physicians does not mean that patients are today receiving less effective care. Actually, the Committee is convinced that the reverse is true. New discoveries and new patterns of medical care now permit one doctor to attend many more patients in a given period of time than ever before. The easy and quick prevention of many infectious diseases, the shorter course of treatment now required for many conditions, and the increasing tendency toward group and hospital practice still further extend the range of effectiveness of the individual physician and in large part offset the increased demands for medical care created by the greater number of children and of old people in our population.

The remarkable advances of medical research translated into medical practice have raised the standards of medical care which *can* be achieved to the highest level in the world today. But this high standard cannot be achieved in relation to the full range of medical needs until we can supply more physicians, improved facilities, and supporting personnel.

Beyond the provision of facilities, equipment and supporting personnel, the only means by which the quality of medical care and the effectiveness of the practicing physician can be still further increased is through medical research and the application of the findings of research. The doctor is dependent on the ammunition that medical research puts into his hands and which has enabled him to treat or prevent diseases, such as tuberculosis, syphilis, pneumonia, poliomyelitis, hypertension, rheumatoid arthritis, and many forms of congenital heart disease against which he was almost helpless at the beginning of the century.

It seems fair to state that the doctor of today is much more effective than his colleague of a generation ago and can therefore handle many more patients in a given period of time and treat them more efficiently. In fact, therefore, medical research has *added* to the medical manpower available for health services and has done so, not by multiplying the number of practitioners of medicine, but by increasing the ammunition of the individual doctor.

Conclusion:

The contribution of medical research to medical practice in terms of new knowledge, techniques, and methods of patient care has been a prime factor in the increase in effectiveness of the individual physician and in raising the standard of medical care to the highest level ever achieved. This gain has outweighed the developing quantitative shortage of medical manpower.

C. EFFECT ON NON-FEDERAL SOURCES OF SUPPORT

The support of medical research from State, industrial, and private sources has increased greatly since World War II during the period of the rapid growth of the Federal program. Thus the total amount of non-Federal support has increased from $60 million in 1947 to an estimated level of $335 million in 1960 (table 2, p. 3). In this period the Federal support has risen from $28 million in 1947 to $380 million in 1960 (from 32 percent to 53 percent of the total). The fact that the increase in Federal support has been more rapid than in non-Federal support is considered by this Committee as a measure of the urgency which the public through their representatives in the Congress places on this effort.

The non-Federal sources of support include State governments, industry, philanthropy, and endowment. Each of these sources has increased since 1947 (table 11) during the period of rapid increase in the Federal program except endowment which has been about constant during the past 3 years.

TABLE 11.—*Source of funds for medical and health-related research*

[In millions of dollars]

Source of funds	Prewar (1940)		Postwar (1947)		1957		1960 estimate	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Total	$45	100	$88	100	$397	100	$715	100
Federal Government	3	7	28	32	186	47	380	53
State Government [1]					10	2	20	3
Industry	25	55	35	40	126	32	215	30
Philanthropy	12	27	15	17	56	14	81	11
Endowment	5	11	10	11	19	5	19	3
Total non-Federal	42	93	60	68	211	53	335	47

[1] Unavailable for years prior to 1957.

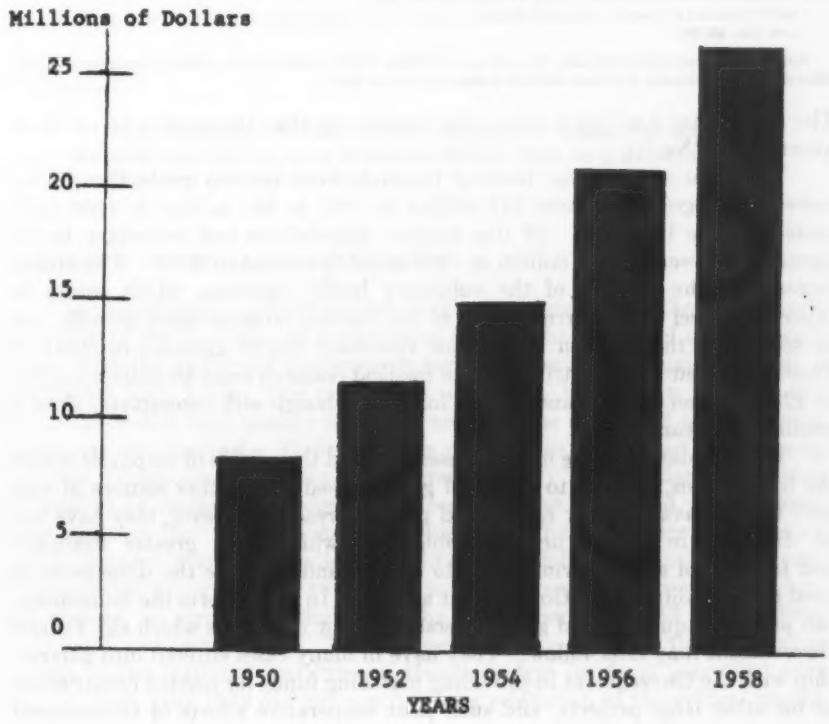
Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (January 1960).

The contribution of State Governments has been studied accurately only within the past 3 years, during which it has doubled to an estimated $20 million in 1960.

Industry has increased its support of medical research from $35 million in 1947 to $215 million in 1960, over fivefold, and now contributes 30 percent of the total support. Research is vital to the progress of most industrial efforts, and the pharmaceutical industry understands this clearly. Industrial research is largely "applied" and in the pharmaceutical industry is oriented toward drug research, but industry also supports a great deal of basic research in universities and medical schools and in its own organizations. Its contribution is substantial.

The subject of greatest speculation in regard to the effect of the expanding Federal program has been that of private philanthropy. Has the knowledge that Federal funds are now more readily available for the support of medical research than in the past tended to dry up the collections of the voluntary health agencies, to decrease the support by foundations in the health field, or to discourage the formation of new foundations with medical orientation?

Chart A. TRENDS IN VOLUNTARY HEALTH AGENCY SUPPORT OF MEDICAL RESEARCH, 1950-1958



[Millions of dollars]

Health agency	1950 [1]	1952 [1]	1954 [1]	1956 [1]	1958 [2]	Ratio,[3] 1950/58 [2]
Total	$8.0	$11.3	$14.7	$20.4	$25.7	3.2
National Foundation (of Infantile Paralysis)	2.3	3.3	2.6	3.1	3.3	1.4
American Cancer Society	3.8	4.6	6.0	7.7	8.6	2.2
National Tuberculosis Association	.2	.3	.4	.8	.8	3.7
American Heart Association	1.2	2.3	3.8	6.2	8.4	6.9
National Society for Crippled Children and Adults	.1	(4)	.1	.1	.3	2.5
United Cerebral Palsy Association	(4)	.1	.5	.5	.5	462.0
Muscular Dystrophy Association of America	(4)	.3	.8	1.4	2.5	108.4
National Association for Mental Health, Inc	(4)	.1	.1	.1	.7	16.7
Arthritis and Rheumatism Foundation	.2	.3	.4	.5	.6	2.7

[1] The National Health Education Committee, Inc. *Facts on the Major Killing and Crippling Diseases in the United States Today* (1959 ed.).

[2] American Association of Fund-Raising Council (Apr. 20, 1959).

[3] Ratio calculated on basis of unrounded figures.

[4] Less than $50,000.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (September 1959).

The Committee has heard convincing testimony that the answer to all these questions is "No."

The total support for medical research from private philanthropy has increased progressively from $15 million in 1947 to $81 million in 1960 (estimated). (See table 11.) Of this amount foundations and voluntary health agencies represented $15 million in 1947 and $55 million in 1960. The steady increase in the support of the voluntary health agencies, which would be expected to feel any deterrent effect of the Federal program most directly, can be seen from the data on nine major voluntary health agencies in chart A. These increased their contributions to medical research from $8 million in 1950 to $25.7 million in 1958 and figures for 1959, though still incomplete, show a continued upward trend.

The foundations have in some cases changed their fields of emphasis within the life sciences, shifting to points of greater need when other sources of support became available for established project areas. However, they have had no difficulty in finding urgent problems in which their greater flexibility and freedom of action permit them to explore and evaluate the dimensions of need more readily than a Government agency. In such efforts the foundations can play a unique role and give leadership in new directions which the Federal Government may later follow. They have in many cases entered into partnership with the Government in providing matching funds for needed construction or for other large projects, and such joint cooperative efforts of Government

with private philanthropy and industry can be expected to increase with great benefit in the future.

One source of funds which has been only partially evaluated to date is the numerous small foundations that have been established in the health field, especially in the past 10 years, many of them by the families of patients who have received benefit from the efforts of medical research. While their total contribution per year may be small, the fact that they are being established is further evidence that the Federal program has not prevented an increase in private giving.

The Committee is convinced that, far from deterring State and industrial participation, public contributions to voluntary agencies, grants from foundations, and the establishment of new foundations in the health field, the Federal effort including the matching funds programs of the Hill-Burton hospitals and the health research facilities construction, has served as a stimulus to non-Federal sources of support to contribute still more substantially. The great diffusion of health knowledge to the public from both Federal and non-Federal programs has been mutually beneficial, and the greater consciousness on the part of the public of the needs of medical research has resulted in both an increase in support of medical research through foundations and voluntary health agencies and an increased determination on the part of the taxpayers to support medical research through their tax dollars.

Conclusion:

The expansion of the Federal program in support of medical research has served as a stimulus, rather than as a deterrent, to non-Federal sources of support.

D. EFFECT ON QUALITY OF REVIEW

The Committee is convinced that, in the administration of the larger funds appropriated for the National Institutes of Health, the quality of the reviewing process and the quality of the research supported have been maintained at a remarkably high level. The chief facts which can be cited in favor of the maintenance of a high quality of review are: (1) The quality of the reviewing groups has not changed. Their members continue to be selected from among the most outstanding scientists of the country. (2) The standards by which the quality of research is judged have certainly not decreased. This Committee believes that these are steadily rising. (3) The percentage of approvals of new research grant applications has been essentially constant for the past 2 years (table 12), averaging 48 percent in amount and 60 percent in number, and showed no significant change in the November 1959 and March 1960 study section-council cycles. Thus, it seems fair to say that the 36 percent increase in the National Institutes of Health budget for fiscal year 1960 over that for fiscal year 1959 did not result in any relaxation of the critical review

to which research applications have been subjected. However, the steady growth in the annual volume of applications resulted in an even greater total of approved applications, and the increased funds appropriated are still not sufficient to pay all the projects approved.

TABLE 12.—*National Institutes of Health: Approval and disapproval rates on new research grant applications,*[1] *June 1957–March 1960*

National Advisory Council meeting dates	Total amount (in thousands)	Approvals (in thousands)		Disapprovals (in thousands)	
		Amount	Percent of total	Amount	Percent of total
June 1957	$23,394	$12,214	52	$11,180	48
October 1957	23,148	12,238	53	10,910	47
February 1958	21,447	10,456	49	10,991	51
June 1958	24,479	10,728	44	13,751	56
October 1958	25,279	13,676	54	11,603	46
February 1959	28,986	15,211	52	13,775	48
June 1959	38,206	17,607	46	20,599	54
November 1959	35,888	16,892	47	18,996	53
March 1960	41,184	19,880	48	21,304	52
	Total number	Approvals		Disapprovals	
		Number	Percent of total	Number	Percent of total
June 1957	1,342	897	67	445	33
October 1957	1,229	820	67	409	33
February 1958	1,212	768	63	444	37
June 1958	1,339	800	60	539	40
October 1958	1,342	873	65	469	35
February 1959	1,510	943	62	567	38
June 1959	1,723	1,006	58	717	42
November 1959	1,644	961	58	683	42
March 1960	1,847	1,082	59	765	41

[1] Excluding deferrals, provisional approvals, and interim Council actions, such as special mail votes.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Division of Research Grants.

It is the Committee's judgment that the quality of the research proposals approved has steadily increased. The research training which investigators have received in recent years as house officers, fellows, trainees, and assistants on research grants is showing results in the research applications now coming to the National Institutes of Health. Many of these demonstrate the investigator's thorough acquaintance with the subject field and competence to utilize the newest developments of instrumentation and technique, and there is no dearth of interesting and original ideas. As the competence of the applicants has increased, so has that of the reviewing scientists, and the Committee be-

lieves that the standards by which the applications are judged have become more stringent. Because of the tremendous increase which has occurred in scientific knowledge and the great refinements in techniques and equipment which have been achieved in the past decade, many projects which were approved 10 years ago would not be considered worthy of approval today. Thus no conclusion can really be drawn from the lack of change in approval rate because improvement in quality and the more critical review may have compensated for each other. The judgment of the Committee represents a subjective, but very strongly held opinion.

Conclusion:

The increasing annual appropriations for the National Institutes of Health in recent years have been administered with maintenance of the same high standard of review which has been characteristic of that program since its inception. Furthermore, the Committee is convinced that the quality of the research supported has improved.

Chapter IV

STATUS OF MEDICAL MANPOWER

A. NUMBER OF PHYSICIANS

The United States is today facing a serious shortage of physicians and dentists in relation to its needs in all three aspects of medicine—teaching, research, and practice. This is true in spite of the fact that our physician/population ratio has remained essentially constant for the last 20 years (table 13), and although we have one of the highest ratios in the world, exceeded only by Israel and the Soviet Union (table 14).

TABLE 13.—*Supply of physicians and dentists: United States, 1930–59, with projections to 1975* [1]

Year	Physicians			Dentists
	M.D.'s and D.O.'s	M.D.	D.O.	
	Estimated number			
1930	164, 900	154, 600	10, 300	73, 100
1940	187, 600	175, 200	12, 400	81, 700
1950	216, 200	203, 500	12, 700	86, 900
1957	240, 300	226, 600	13, 700	97, 600
1958	244, 500	230, 600	13, 900	98, 540
1959	249, 100	235, 000	14, 100	99, 400
1965	274, 800	259, 900	14, 900	106, 700
1970	294, 900	279, 000	15, 900	112, 900
1975	312, 800	296, 100	16, 700	118, 100

Year	Population (in thousands)	Rate per 100,000 population			
1930	123, 188	133. 9	125. 5	8. 4	59
1940	132, 122	142. 0	132. 6	9. 4	62
1950	151, 683	142. 5	134. 2	8. 3	57
1957	171, 198	140. 4	132. 4	8. 0	57
1958	174, 064	140. 5	132. 5	8. 0	57
1959	177, 103	140. 7	132. 7	8. 0	56
1965	195, 747	140. 4	132. 8	7. 6	55
1970	213, 810	137. 9	130. 5	7. 4	53
1975	235, 246	133. 0	125. 9	7. 1	50

[1] At currently planned levels of school output.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service. *Public Health Reports*, vol. 75, No. 3, (March 1960), p. 278, table 2.

TABLE 14.—*Estimated number of physicians per 100,000 population, year 1956*

Israel	216/100, 000
Union of Soviet Socialist Republics	164/100, 000
United States	140/100, 000
West Germany	135/100, 000
Norway	117/100, 000
Denmark	115/100, 000
England and Wales	110/100, 000
Sweden	80/100, 000

Source: World Health Organization and Chancelleries in Washington, D.C.

The decline in number of physicians in medical practice has been mentioned above (table 9, p. 21). We should not forget that we have maintained our total physician/population ratio at its present level in recent years only by importing a large number of foreign-trained physicians. In 1959 approximately 8,400 foreign-trained physicians from 91 countries were serving in U.S. hospitals, representing 24 percent of the intern and resident staffs, and we would have great difficulty in maintaining many hospitals without them. In 1958 over 1,300 foreign-trained physicians were licensed in the United States representing 17 percent of the new physicians entering practice.

The Committee believes it is extremely unwise for this country to be forced to meet its need for doctors by such heavy reliance on foreign sources. As pointed out in the Bane committee report, "These figures raise the question of whether this country, with its wealth, should be dependent on other nations for a net inflow of physicians to serve our people, when there are so many urgent needs for medical service in other parts of the world. In no other field of education is there a situation in which the United States draws to the same extent on persons educated in other nations to maintain its high level of service."

Thus, at a time when the United States should be in a position to export physicians to help in the underdeveloped countries, as the Soviet Union is doing, we find ourselves unable to staff many of our own hospitals without borrowing medical personnel from abroad. Certainly they are most welcome; they should be given opportunities for training in this country, and the service they render is greatly appreciated, but the Committee believes that the country's dependence on them has been excessive.

The chief factors creating our present relative shortage of medical manpower are: (1) the tremendous increase in population that has occurred in the past 20 years, from 132 million in 1940 to 180 million in 1960; (2) the fact that we have not expanded our production of physicians at a sufficient rate to meet the growing requirement for medical care of the increasing population in addition to the augmented needs for teaching and research; (3) the shift in population distribution in the United States so that there is a greater percentage of the very young and very old who require the greatest amount of medical care; and (4) the demand for health services by our people resulting from our rising standard of living, the provision of hospital and medical insurance, and the increasing health-consciousness of our people.

The problem will grow and the number of physicians per 100,000 population will decline (table 13) unless we begin immediately to take energetic measures, as recommended in the Bane Report, leading to the training of more physicians and dentists. All sectors of medical activity—patient care, teaching, and research—will expand at less than an optimum rate until this central national problem can be solved.

Recommendation:

TRAINING OF ADDITIONAL PHYSICIANS AND DENTISTS

Measures should be initiated promptly to train greater numbers of physicians and dentists by implementing the recommendations of the Bane Report (p. 11).

B. RECRUITMENT OF MEDICAL STUDENTS

During the last 3 years, the number of college students applying to medical schools has dropped at a time when the number of college graduates has been increasing (table 15). Furthermore, the quality of applicants has decreased. These trends have occurred to a degree which constitutes a serious threat to the necessary increase in the number of physicians in the future.

TABLE 15.—*Medical school applicants*

Year [1]	Total degree-credit enrollment: aggregate United States [2]	College graduates (bachelor's and 1st professional degrees U.S. aggregate) [3]	Total number medical school applicants [4]	Number of medical school applicants as percent of college graduates
1948	2, 408, 249	366, 698	24, 242	6. 6
1949	2, 456, 841	433, 734	24, 434	5. 6
1950	2, 296, 592	384, 352	22, 279	6. 0
1951	2, 116, 440	331, 924	19, 920	6. 0
1952	2, 148, 284	304, 857	16, 763	6. 0
1953	2, 250, 701	292, 880	14, 678	5. 0
1954	2, 468, 596	287, 401	14, 538	5. 1
1955	2, 678, 623	311, 298	14, 937	5. 0
1956	2, 946, 985	340, 347	15, 918	4. 7
1957	3, 068, 417	365, 748	15, 791	4. 3
1958	3, 258, 556	[5] 390, 000	15, 170	3. 9

[1] Fall enrollment.

[2] U.S. Department of Health, Education, and Welfare, Office of Education. *Opening (Fall) Enrollment in Higher Education, 1958, Analytic Report*, Circular 545 (1959), p. 7, table 5, for the years 1948-58; *Opening (Fall) Enrollment in Higher Education, 1959, Institutional Data*, Circular No. 606 (November 1959), p. 1, table A, for the year 1959.

[3] U.S. Department of Health, Education, and Welfare, Office of Education. *Earned Degrees Conferred by Higher Educational Institutions, 1957-58*, Circular No. 570 (May 1959), p. 3, table 4, for the years 1948-57; *Projection of Earned Degrees to 1969-70*, Circular OE-54002 (September 1959), p. 5, table 2, for the years 1958 and 1959.

[4] American Medical Association, Council on Medical Education and Hospitals. *Medical Education in the United States and Canada, 1958-59*, (reprinted from the Education Number of the Journal of the American Medical Association, vol. 171 (Nov. 14, 1959), p. 1536, table 23.

[5] Estimated.

The main factors leading to the loss of popularity of medicine as a career are (1) the great length and cost of medical training; (2) the unbalanced situation in which Federal and non-Federal programs support Ph.D. candidates in the basic sciences while little support is available to medical students; (3) the fact that many other satisfying and intellectually stimulating career opportunities in science with high prestige and adequate financial reward have developed during the past 20 years and now attract the outstanding college graduates, whereas medicine had little competition in earlier years; and (4) a decrease in attractiveness of the image of the physician as viewed by high school and college students.

The financial problems of medical students can be indicated by the fact that 52 percent of all medical school graduates in the 1959 class were in debt to some degree, and 20 percent had indebtedness of $4,800 or more.[1] Medical school tuitions have continued to rise and the average cost of 4 years of medical school was found to be approximately $11,600 for those graduating in 1959. Scholarship support has been meager, students hesitate to shoulder a large loan, and the curriculum is so demanding that few students can carry a part-time job without considerable sacrifice of time needed for their studies. Thus the choice of medicine as a career has been to a considerable extent influenced by financial factors, and many promising college graduates who would have liked to study medicine have been discouraged.

The Federal Government now provides fellowships for every field of higher education in the sciences except medicine. During the coming year approximately 10,000 predoctoral fellowships in the physical, life, and social sciences, psychology, engineering, the arts, the humanities, and education will be awarded by four Federal agencies—the Department of State, the National Science Foundation, the Office of Education, and the National Institutes of Health.

These fellowships (1) give the graduate student free choice of the institution in which he will study; (2) they provide him a stipend of $1,800–$2,500 with a $500 allowance for each dependent, plus travel allowance; (3) they pay full tuition to the institution; and (4) in some instances they provide an additional subsidy to the institution.

In contrast, the Federal Government makes no fellowships available to medical students. Most medical schools offer some scholarship support to students in greatest need after the freshman year but, according to the Bane report, only 10 percent of medical students (or 2,960) held scholarships in 1958. These averaged only $500 in amount and most did not pay tuition.

The Ph.D. candidates in the basic sciences have another source of income available to them. Many obtain part-time jobs as assistants on research projects or laboratory assistants in the basic science departments. These jobs fit into their training and usually do not interfere with their progress toward a

[1] Association of American Medical Colleges, Education Research Service. *Datagrams*, vol. 1, No. 9 (March 1960) and unpublished data from the Association of American Medical Colleges.

degree. On the other hand, as indicated above, the medical school curriculum leaves little time for part-time jobs. Although many students do carry them in addition to working in the summer, they rarely earn as much by these efforts as the Ph.D. candidates.

Thus a career as a graduate student in the basic sciences offers financial security with good job opportunities available, both during the period of study and afterward, while a medical career offers longer years of work for a degree with high tuition and little or no financial support. Small wonder that fewer students are choosing medicine as a career!

The argument has frequently been offered that a medical student can look forward to such large financial returns as a practicing physician that he should be willing to go into debt, if necessary, to obtain a medical education. The same considerations are advanced in regard to dentists. This Committee wishes to emphasize that this is not true for the doctors and dentists who remain in academic careers, and believes that students oriented toward academic careers in these fields deserve support from the Federal Government equal to that now given to graduate students in the basic sciences. Such support can be provided in the form of scholarships for academically oriented students equivalent to the fellowship programs for graduate students in the basic sciences, or as loans which could be remitted if the individuals remain in academic life.

The outlook for the future need not be too discouraging. Within a few years the increase in birth rate which began in World War II will be reflected in a great wave of young people sweeping into the colleges and universities, and a rising number of college graduates will enlarge the manpower pool from which medical school applicants can be expected to come. If at the same time a greater effort can be made to present to young people in the high schools and colleges information concerning the opportunities for service, the challenge, satisfactions, and rewards of careers in the medical field, and if a more secure future can be offered to medical school applicants through scholarship and fellowship support, the number choosing medicine as a career can be expected to increase. Nevertheless, it will be a serious challenge to increase the number of medical school graduates by 3,600 a year by 1975, as recommended in the Bane Report. This can only be done if we start immediately on the expansion of our national medical educational capacity (see p. 12) and take steps to reduce the financial deterrent to the study of medicine.

Recommendations:

(1) FINANCIAL AID TO MEDICAL STUDENTS

The Federal Government should supplement private, industrial, and State sources in providing scholarship, fellowship, and loan assistance to medical and dental students interested in careers of teaching and research, as it now does to Ph. D. candidates in the basic sciences.

(2) INFORMATION ON CAREERS IN THE MEDICAL SCIENCES

Greater effort should be made through the schools and the various media of communication to inform more young people of the opportunities for service and the challenge, satisfactions, and rewards of careers in medicine, dentistry, and public health.

C. Manpower for Research

Physicians and dentists make up only about one-half of the professional personnel involved in medical research. A steadily increasing number of Ph. D. graduates and candidates in the physical and life sciences is being added to this group. The total manpower pool also includes personnel in the paramedical specialties and allied fields, technicians with various levels of training, and unskilled helpers in supporting roles.

The total potential manpower for research in the United States in the next 10 years should increase substantially. The great rise in number of college graduates which will occur when the students now in our primary and secondary schools begin to move through the colleges has already been mentioned. Thus the base from which to recruit our professional scientists seems secure. It should be recognized, however, that the number of medical, dental, and Ph. D. graduates is already fixed until 1963 by the number now enrolled in schools, and the number for 1964 by the number which will be enrolled next fall.

The percentage of physicians participating in teaching and research has been increasing slowly but steadily over the last 20 years, from less than 2 percent (3,349) in 1940 to 3 percent (7,931) in 1959, or 1½ times (table 10, p. 22). During that same period the national program in support of medical research increased from $45 million in 1940 to $715 million in 1960, or almost 16 times (table 2, p. 3).

Thus the number of physicians involved in research does not bear a close relationship to the funds which can be profitably utilized in the medical research program of the country, and the present need for more doctors is not a limiting factor in the further expansion of that program.

The importance of the research-trained doctors in medical research must be recognized, however. Their guidance and advice are essential at many points, and they carry the main responsibility in the area of clinical research through which the findings in the basic sciences are applied to the problems of disease in man. Each well-trained doctor plays a major role in the research

and training programs with which he is associated. Through great new advances in instrumentation, the support of ancillary personnel, and new organizational structures for research, the productiveness of the individual doctor has been greatly magnified. More are needed in medical research, but the present program can still be greatly expanded without adversely affecting medical practice or teaching.

An important study just completed by the Office of Education of the Department of Health, Education, and Welfare under the joint sponsorship of the National Institutes of Health and the National Science Foundation, but not yet published, shows the changes in graduate enrollment in the biosciences, physical sciences, psychology, and social sciences between 1953–54 and 1959–60 in 74 schools accounting for more than 90 percent of the total Ph. D.'s awarded in the sciences (table 16). These figures should be divided by a factor of 4 to give an approximation of the maximum annual number of Ph. D. graduates in these different fields through 1964. The increase in the total number enrolled in the science fields selected, from 32,482 in 1953–54 to 44,022 in 1959–60, is extremely encouraging.

TABLE 16.—*Trends in graduate enrollment in selected science fields at 74 schools,*[1] *1953–54* [2] *and 1959–60* [3]

Field	Number of schools		Number of graduate students enrolled		Increase in graduate enrollment 1953–54 to 1959–60	
	1953–54	1959–60	1953–54	1959–60	Number	Percent
Biosciences	70	72	7,579	9,312	1,733	23
Preclinical	62	66	3,270	4,011	741	23
Other biosciences	67	68	4,309	5,301	992	23
Mathematics and statistics	71	72	2,800	5,866	3,066	110
Physical sciences	72	72	11,874	15,711	3,837	32
Psychology	65	65	4,066	5,359	1,293	32
Selected social sciences	60	66	6,163	7,774	1,611	26
Total of above	72	74	32,482	44,022	11,540	36
Total, all other fields	72	74	71,070	130,203	59,133	83
Total graduate enrollment	72	74	103,552	174,225	70,673	68

[1] These 74 bellwether schools were selected because they consistently have accounted for better than 90 percent of total Ph. D.'s awarded in the sciences.

[2] The 1953–54 data are based primarily upon enrollment reported to the National Science Foundation and published in *Graduate Student Enrollment and Support in American Universities and Colleges 1954* (U.S. Government Printing Office, Washington, 1957). However, in some fields, and especially in the biosciences, National Science Foundation coverage in 1953–54 was incomplete. To obtain 100 percent reporting of 1953–54 enrollment in these 74 schools the National Science Foundation data were revised on the basis of information supplied by department chairmen in response to an inquiry from the Resources Analysis Section, Office of Program Planning, National Institutes of Health.

[3] The 1959–60 data are based on enrollment reported in the First Annual Survey of Enrollment for Advanced Degrees, Fall 1959, jointly sponsored by the National Institutes of Health and the National Science Foundation and conducted by the Office of Education.

The fact that the increase in the physical sciences (32 percent) and in mathematics (110 percent) is greater than in the biological sciences (23 percent)

reflects the rising demand in industry, defense, and space activities for trained manpower for the first named fields. Increasingly, medical research will also draw from this pool of trained mathematicians, physicists, and chemists.

However, in order to staff the greater number of medical schools which will be needed in the future and to help support the expanded medical research effort which is essential to the improvement in the health of the people, energetic measures should be taken to recruit more young people, into careers in the biological sciences and especially into the preclinical fields, as well as into medicine itself. These measures should include a variety of programs at the college and secondary school levels to bring the opportunities and challenges of medicine and the biosciences to the attention of young people at an early stage in their careers. Of prime importance would be an information program such as that recommended in the preceding section. The provision of part-time and summer jobs in research laboratories; training grants to improve college and secondary school teaching in the biological sciences; and scholarships for undergraduate science majors who show interest and talent in the biological sciences are all strongly advocated.

For supporting personnel requiring shorter periods of training, the potentialities are almost limitless. Industry can be expected to provide individuals displaced by a shortened workweek and increasing automation, many of them with considerable technical training, who would be interested in either full or part-time work in medical research. There will be increasing need for individuals with technical competence in electronics and engineering and these are now being trained in large numbers. There is also a large reservoir of women graduates of high schools and colleges which has remained largely untapped with little effort to interest them in medical research at either the professional or nonprofessional level.

Thus the Committee concludes that the manpower available is sufficient at both the professional and nonprofessional levels to support a substantial expansion in the medical research effort of the country. If vigorous efforts at recruitment and training and the construction of health educational facilities are initiated, the manpower available by 1970 should be ample for any program of medical research which may seem indicated.

Conclusion:

The need for more physicians and dentists should not be considered a limitation of the continued expansion of the health research effort of the country at this time. Ph.D. graduates and candidates, now making up approximately one-half of the total professional personnel engaged in health research, together with the support of personnel in the paramedical specialties, technicians, and others, assure an adequate manpower base for the continued growth of medical research. Moreover, the use of new instrumentation, techniques, and organizational structures for research can greatly magnify the productivity of the manpower available.

Chapter V

GOVERNMENT AGENCIES OTHER THAN THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Since the Committee was charged with consideration of "the funds provided by the Government for research in dread diseases," it has devoted the greater part of its deliberations to a review of the programs of the Department of Health, Education, and Welfare, and particularly that of the National Institutes of Health which Congress has made its chief instrument for the support of such research.

It has also surveyed the medical research programs of other Federal agencies which have health responsibilities and which carry out—or have the possibility of carrying out—research either directly or indirectly related to the attack on major disease problems. The level of support given to these agencies since 1957 has been presented in table 3, page 4. The contribution to the total Federal effort in the fight against disease and disability has been evaluated, as well as the extent to which that contribution could be increased.

It is appropriate and essential for any agency of the Federal Government having medical responsibilities for patient care to carry out research in relation to the problems of its patients. The Committee subscribes wholeheartedly to the belief that the continued association of physicians with an active research program is vital to the maintenance of the highest standard of medical care. Furthermore, the members believe it would be most unfortunate if the opportunities for research provided by the special circumstances affecting the personnel of these different agencies were not utilized. Thus, the unusual exposure to tropical diseases and other diseases of foreign countries to which members of the Armed Forces may be subjected provide special opportunities for study of the prevention and treatment of these conditions and for careful followup. Also, the closed populations of veterans hospitals and the complete and careful records kept on these patients permit unusually accurate epidemiological and statistical studies of various disease states.

Those Government agencies which have specific missions in the health field with research needs should have authorization and funds to support both intramural and extramural research in relation to their specific health missions. Where research on pertinent problems cannot be carried out in the intramural facilities of an agency, that agency should be empowered to award research grants or contracts and give sustained support to such studies by investigators in non-Federal research institutions. Support by such Federal agencies should

not be limited to projects which are clearly oriented toward the mission of the agency, but should include a proportion of basic research which may or may not eventually make a contribution to the needs of the agency or service.

Furthermore, the Committee believes it to be desirable to have more than one source within the Federal Government to which an investigator can apply for support of medical research.

Recommendation:

DIVERSITY OF FEDERAL SUPPORT FOR MEDICAL RESEARCH

Other Federal agencies besides the National Institutes of Health should continue to maintain strong programs in support of medical research. These programs should not only serve the specific health missions of these agencies and make their operations more effective but should also utilize their special opportunities to make contributions of particular value to the total medical research effort of the country. The agencies should be given the funds to support both basic and applied research and to sustain both in-service programs and strong extramural programs in support of medical research in non-Federal nonprofit research institutions.

A. DEPARTMENT OF DEFENSE

The medical services of the Army, Navy, and Air Force have been forced to operate under essentially level budgets for the past few years (table 17). The continuing inflationary spiral and the necessary salary increases for both professional and technical civilian help have imposed a gradual belt-tightening process until medical research productivity is being slowly but surely curtailed. Through skillful leadership and careful administration, standards have been maintained at a high level and outstanding research contributions have been made, but under increasing difficulties.

TABLE 17.—*United States Department of Defense medical research expenditures, 1957–61*

[In millions of dollars]

Fiscal year	Air Force	Navy	Army	Total
1957	4.8	4.5	13.7	23.0
1958	5.0	4.5	14.1	23.6
1959	4.4	5.2	14.6	24.2
1960	4.8	5.9	18.6	29.3
1961 (President's budget)	3.9	4.6	21.2	29.7

Source: Department of Defense, Office of Science, Defense Research and Engineering, Washington, D.C.

The Surgeon General of each of the three armed services presents and defends his budgetary request to the Research and Engineering Division of the Department of Defense and his needs are never heard directly by the Congress. Those who approve the medical share of the research and development dollars are not medically trained and therefore may not always understand fully the importance of medical research in support of the armed services.

Medical research in the Department of Defense is not a line item in the budget and represents only 0.0006 percent of the overall defense budget and 0.015 percent of the entire military research and development budget. The budget for medical research, therefore, fails to command attention, and it becomes difficult for responsible officials to remain informed and aware of the medical research needs of the armed services.

This Committee believes that the military medical research problems are in general so specialized and essential to the missions of the respective services that they should not be handicapped by budgetary limitations which do not even provide for the rising costs of research. Most research organizations have found that an increase of at least 5 percent a year is the price of just standing still. With the great new research opportunities being uncovered every day by new knowledge in the basic sciences, no medical research facility should be content to, or forced to, or allowed to, stand still.

The special problems of military medicine, such as the treatment of mass casualties in modern and conventional warfare, the prevention of contagious disease in large concentrations of troops, and the prevention and treatment of tropical diseases and other diseases of foreign countries in military personnel stationed abroad as studied under the Armed Forces Epidemiological Board, are extremely pertinent areas of research for the armed services. Funds for these purposes are easily justified in any budgetary consideration. The need for support of basic research less directly related to the immediate mission of the three services is more difficult to explain to those unfamiliar with the military programs but should not be neglected.

The medical research program of the Air Force is highly specialized in relation to problems of flight, and therefore almost all responsibility for research on disease prevention and treatment, except on those problems that have reference to acceleration, deceleration, altitude and long confinement in a closed chamber, have by agreement and custom been left to the medical services of the Army and the Navy. This Committee is primarily concerned with research on disease and therefore does not believe it appropriate to comment on the many excellent and interesting programs supported by the Air Force in the fields of basic biology and physiology in relation to flight or to make recommendations outside its field of responsibility. It therefore proposes to limit its discussion to those aspects of the hospital, inservice and extramural programs of the services which have direct bearing on the attack on major disease problems.

1. *Hospitals of the Armed Services*

The armed services have an obligation to military personnel to provide them with the highest standard of medical care possible. It is generally recognized that the attainment of such high standards in any hospital is greatly favored by the continued contact of its professional staff with an active program of medical research. The Committee has heard testimony that at present the severe limitation of funds and of professional and supporting personnel, both military and civilian, in military hospitals makes the maintenance of any research program exceedingly difficult.

The hospitals of the services represent a remarkably valuable and unique resource for certain kinds of medical research. They treat a controlled population on which accurate medical records are kept during military service. These records are retained in a central records file, are available for study if the individual returns to civilian life, and are incorporated into those of the Veterans' Administration if the individual later enters a Veterans' Administration hospital. Moreover, autopsies are performed on almost all military personnel dying in Armed Forces hospitals during peacetime. The Committee believes that the observation of the disease conditions and behavioral patterns which occur in members of the services and the evaluation of the preventive measures and therapy carried out in the best interest of the military personnel are important and essential functions of the medical corps of the three services.

The Armed Forces have a responsibility to the young physicians who must fulfill their period of obligatory military service. These men will subsequently make the greatest contribution to the services or to civilian medicine if they are allowed to continue their medical training to the greatest extent possible in the course of their assignments. Moreover, this period represents the best opportunity for the Armed Forces to recruit doctors for the regular medical corps, and the quality of the physicians who can be persuaded to stay in military service will depend in large part on the excellence of the research programs they observe while in uniform and on the research opportunities they can see in the years ahead. For the military hospitals to be good training centers, they must have strong research programs, and the Committee believes that many are far short of this goal at the present time.

2. *Military Medical Research Institutes*

The support of the specialized medical research institutes of the Army and Navy has been so limited in the past few years that they are falling far short of their potential contributions in basic and applied research to the special needs of the services and to the increase in knowledge of disease in general. The budgets for these institutes have not kept pace with the increasing costs of research owing to inflation, and this has necessitated a gradual reduction in staff, equipment, supplies, services, and maintenance to the point of diminishing returns. Outstanding scientists, deprived of adequate supporting personnel

and services, have resigned to take better supported research positions elsewhere. These fine facilities which have been built at the taxpayers' expense are not being utilized effectively at the present time; they are not adequately staffed; and funds are not available to maintain them in efficient working condition or to replace equipment which has become obsolete. Support is not now sufficient to permit more than token realization of their potential contribution.

It seems to the Committee that a relatively small investment in the research institutes of the services would yield a very large return in research productivity.

The organizational separation of some of these institutes from the clinical services with which most of them are geographically associated should not be allowed to prevent close cooperation between such facilities, the rapid application of new research findings, and the most efficient utilization of men and facilities.

An increasing deterrent to achievement of the full contribution of the research institutes is the growing shortage of trained manpower in the services. Young men can now fulfill their military obligation by coming into one of the services for 6 months immediately after high school or during or after college. The number of men enlisting with advanced training in the sciences who could contribute to the research programs in the research institutes or the hospitals has therefore decreased.

Another manpower problem arises from the fact that the number of officers in the medical corps bears a fixed relationship to troop strength and, as the size of the services has been decreased since the Korean action, so has the number of physicians in uniform. The number now permitted is not sufficient to meet the current demands for medical care, to undertake research in military hospitals, and to staff the research institutes as well.

The reduction in numbers of physicians, basic scientists, and technically trained men in uniform would not necessarily be a handicap if authorization and funds could be obtained to permit the employment of the required number of individuals with the needed experience and skills from civilian ranks, and at civil service salaries which would be fairly competitive with comparable jobs elsewhere.

At the present time, authorization and funds for more civilian positions in the inservice medical research programs of the Armed Forces are urgently needed. If the special research institutes are to function at their full potential, they need to be restored to their full staff complement with substitution of civilian for military personnel where necessary.

In the positions of leadership in the military research institutes, there must be careful consideration of the extent to which these can be staffed by regular military officers and of the extent to which they should be staffed by civilian scientists. In research programs, a large degree of continuity of administration is desirable and the frequent rotation of military officers makes this difficult.

The Committee believes that there should be greater use of the system of civilian research advisers to provide continuity where a department is headed by a military officer, and that, whenever the highest competence to head a

department cannot be found within the military, greater consideration should be given to the employment of outstanding civilian scientists under civil service, with the provision of more positions at the Public Law 313 level.

In short, the Committee concludes that there are wasted opportunities for research in both the military hospitals and the special research institutes of the services which can only be corrected by an increase in funds and in professional and supporting personnel for these installations.

3. *Extramural Programs*

The Armed Forces have failed to obtain support for their extramural programs in relation to the increase in costs of research, so that they can no longer support some projects which were extremely helpful to them in the past.

All three services have decreased their extramural programs to the minimum of applied research they believe to be necessary for their direct needs and of basic research which seems likely to be helpful to their missions in the future. To maintain the remaining projects in the face of rising research costs and inadequate basic budgets, they have become increasingly dependent on supplementary funds made available toward the end of the fiscal year. These have varied markedly. When supplementary funds have been obtained to support special projects, these have not been accompanied by any continuation funds in the budget, and it has been very difficult to finance a stable program on the uncertain expectation of such supplements. Some projects have had to be discontinued abruptly, although a terminal year is given whenever possible. Investigators are, however, becoming understandably reluctant to apply for or accept armed services support for any long-term project of medical research, since it may have to be placed on a terminal year basis at the next renewal, and such uncertainty is disturbing to the stable operation of a research program.

The Committee believes that the support of the extramural programs of the three services should be increased to a point at which projects considered of highest priority could be financed completely from their basic budgets with annual increases to take care of the rising costs of research.

Beyond that the services should have the funds to support a vigorous progressive program aimed at the solution of the major problems of military medicine, instead of being limited to what is largely a holding action at the present time. Opportunities do exist to solve some of these problems, but intensive research must be supported if they are to be realized.

The Advisory Panel on Medical Sciences to the Secretary of Defense recommended 3 years ago in April 1957 that the medical research budgets of the three armed services be doubled. In view of the large backlog of research needs which have not been met under the low budgets of the past few years, the Committee considers this to be a conservative estimate of the requirements of the Armed Forces.

4. *Liaison Between Government Agencies*

The Committee finds that the liaison between the three armed services and the National Institutes of Health could be improved. The administrative staff of the National Institutes of Health is not sufficiently aware of the research being sponsored through the intramural and extramural programs of the armed services, and the officers serving the extramural programs of the armed services are in general poorly informed about both the intramural and extramural programs of the National Institutes of Health. The practice of having representatives of the three armed services attend meetings of the National Institutes of Health study sections and councils is sound, but the individuals selected to represent the services have usually been chosen on the basis of competence in the subject reviewed by the particular advisory group, and often do not have any direct knowledge of the extramural research programs supported by their respective services. Furthermore, they are often poorly informed about the intramural program of their own services except for the part carried out in their own institutions.

The Committee would suggest that this could be corrected without great difficulty if the representative from the service to a National Institutes of Health study section or council were required to study the general content of the extramural and intramural programs of his service relating to the field of that specific advisory body with special attention to grants and contracts.

Since the advisory committees of the services are not as centralized as those at the National Institutes of Health, except for the commissions of the Armed Forces Epidemiological Board and the committees of the National Academy of Sciences-National Research Council which are used to a variable extent by the armed services, it is not practical for the National Institutes of Health to be represented in all the reviewing processes of the three services. Therefore, the National Institutes of Health must rely for information about military support of research pertinent to, overlapping, or duplicating research projects under consideration by their study sections, almost entirely on the Bio-Sciences Information Exchange.

Here it is disturbing to find that information about project applications to the services is not routinely forwarded to the Bio-Sciences Information Exchange until a final decision has been made, and that the services do not routinely consult the Bio-Sciences Information Exchange with regard to new research applications. It is quite possible today, therefore, for one investigator to have made an identical application to one of the services and to the National Institutes of Health and be paid by both without any possibility that the National Institutes of Health would learn about the duplication through the Bio-Sciences Information Exchange, one of whose functions is to forestall just such an eventuality.

In this connection it is encouraging to learn that more divisions of the services are planning to register their research programs with the Bio-Sciences Information Exchange and that the Navy and Air Force are now registering a large part of their intramural as well as their extramural programs. There is some indication that the Army may soon adopt the same policy.

The Committee believes that the Bio-Sciences Information Exchange is serving a very important role in centralizing and making readily available non-classified information on research in the biosciences, but it is dependent for its effectiveness on the completeness with which Federal and non-Federal agencies supporting research make information available to it. The Committee feels strongly that all Federal agencies should utilize and give full cooperation to this extremely valuable service.

Conclusions:

(1) The maintenance of a strong medical research program, both extramural and intramural and including basic as well as applied research is essential to the armed services for the achievement of the following goals:

(*a*) The acquisition of knowledge necessary for the specific missions of the three armed services;

(*b*) The maintenance of the highest standards of patient care for military personnel and their dependents in hospitals of the armed services;

(*c*) The advancement of medical knowledge through the utilization of the opportunities for good research observations under well-controlled conditions with unusual opportunities for follow-up which the hospitals of the armed services can afford. This is especially important in military hospitals in foreign countries where less familiar disease conditions may occur.

(2) The support of medical research through the Department of Defense has not been sufficient to fulfill adequately the purposes for which this support was given. The armed services represent an important resource for medical research which, primarily because of lack of funds and personnel, is being poorly utilized at the present time.

Recommendations:

(1) INCREASE IN APPROPRIATION FOR MEDICAL RESEARCH BY THE ARMY, NAVY, AND AIR FORCE

As recommended by the Advisory Panel on Medical Sciences to the Secretary of Defense 3 years ago, the appropriation for medical research in the armed services should be approximately doubled in order to permit the full utilization of the excellent facilities and opportunities for research available in military research institutes and hospitals.

(2) INCREASE IN NUMBER OF CIVIL SERVICE POSITIONS FOR THE DEPARTMENT OF DEFENSE

The three armed services should be authorized and provided with funds to employ in military hospitals and research institutes a larger number of civilian scientists and the necessary supporting personnel under civil service, including additional Public Law 313 positions.

(3) INCREASED STABILITY AND LEVEL OF SUPPORT FOR EXTRAMURAL PROGRAMS OF ARMED SERVICES

Sustained and expanded appropriations should be provided for more stable support of the extramural medical research programs of the armed services.

(4) USE OF BIO-SCIENCES INFORMATION EXCHANGE

The Committee urges all three armed services to give full cooperation to, and utilize the services of, the Bio-Sciences Information Exchange in providing and obtaining information on the support of research, and recommends that they register all research applications when received, as the National Institutes of Health, the Atomic Energy Commission, and the National Science Foundation have done so effectively.

B. VETERANS' ADMINISTRATION

The Committee wishes to give high praise to the Department of Medicine and Surgery of the Veterans' Administration for its determined effort in the face of a very limited budget to make the most of its research opportunities. The Committee believes that the Medical Director of the Veterans' Administration and his staff are well aware of the great research potentialities in their hospitals and that it is primarily lack of funds that prevents investigators in the Veterans' Administration program from making a much greater contribution to the attack on disease.

While it is true that the population of the Veterans' Administration hospitals is selected, in that it is primarily male and reflects predominantly certain age ranges, it is an enormous population which has been thoroughly studied over a number of years and with the most complete records available on any large population group. Moreover, their records are coded and can be subjected to rapid analysis to yield a tremendous body of data with a vast number of possible correlations. The follow-up agency of the Veterans' Administration centered in the National Academy of Sciences-National Research Council is well organized to obtain data on almost any type of follow-up study which might be desired. The Veterans' Administration is thus a vast resource in the study of the dread diseases, most of which affect the veterans as well as the civilian population.

The Committee believes that the Veterans' Administration cannot give the best possible medical care to the veterans without the existence of an active research program in its hospitals. This serves to provide a stimulating intellectual environment for the staff to keep them informed of new developments in medicine and to attract into the Veterans' Administration program the best type of well-trained young physicians.

The Veterans' Administration can make its potential contribution to the advancement of medical knowledge through the support of both basic and applied research in its intramural program and the full utilization of the very fine research opportunities provided by the patient population, records, and facilities in its hospitals.

In the opinion of the Committee, the Veterans' Administration should also have the authority to carry on an extramural program, as it did in years past, for the extension of research support to non-Federal institutions for studies on those particular problems and diseases which affect the greatest number of their patients. These would include aging, atherosclerosis, cancer, neurological diseases, mental health, etc., and also methods of improving hospital care.

One of the most difficult problems facing the Veterans' Administration is that some of its hospitals are too far removed geographically from any medical school to permit effective collaboration with a school under the supervision of a dean's committee. The staff in such a "rural" Veterans' Administration

hospital often feels isolated and out of the main stream of medicine. The Committee believes, however, that the establishment of better transportation, by special plane or helicopter if necessary, and better communication with a medical school, possibly by television, may in the near future establish effective medical school relationships for all Veterans' Administration hospitals.

The Committee would like to commend the Veterans' Administration for its very effective liaison with the National Institutes of Health study sections and councils, on which it is represented by well-informed members of Veterans' Administration hospital staffs or the central administration in Washington. The Committee also believes that the excellent cooperation given by the Veterans' Administration to the collaborative programs of the National Institutes of Health has been extremely helpful and productive.

Conclusion:

The present level of support of medical research in hospitals of the Veterans' Administration is inadequate to permit the full contribution that agency can make to research on the dread diseases.

Recommendation:

INCREASED APPROPRIATION FOR VETERANS' ADMINISTRATION

The appropriation for the Veterans' Administration program of medical research should be substantially increased for 1961.

C. NATIONAL SCIENCE FOUNDATION

The Committee finds the research supported by the National Science Foundation and the National Institutes of Health to be mutually complementary in the field of the life sciences and believes that the liaison between these two agencies is effective in minimizing undesirable duplication of effort.

One of the greatest needs for the continued growth of scientific research in this country is the training of additional manpower. The splendid support given by the National Science Foundation in recent years to graduate study in the basic sciences has helped substantially to increase our pool of trained manpower for research. The fact that the present support discriminates against medical students has been mentioned, and this Committee has recommended that this situation be equalized.

The various National Science Foundation programs designed to raise the quality of science teaching in our educational institutions from the colleges and universities down to the high schools are proving of remarkable value and represent one of the greatest forces active today for increasing the quality and quantity of scientific manpower of many types for the future.

D. ATOMIC ENERGY COMMISSION

The Committee is greatly impressed by the well-rounded program in radiobiology developed by the Atomic Energy Commission and can only hope it will continue to receive support in proportion to its needs and inevitable growth.

The contribution to our knowledge in radiobiology made by the Atomic Energy Commission and the research efforts of other Federal and non-Federal groups in regard to the biological effects of ionizing radiation, radiation protection, increasing resistance to radiation, and the development of therapeutic procedures to use after whole-body irradiation injury, will have a profound effect on military and civil defense planning. The close collaboration of the Atomic Energy Commission with the Department of Defense, the Office of Civil and Defense Mobilization, and the Division of Health Mobilization of the Bureau of State Services must be made even more effective in the future.

Greater consideration must be given to the effects of ionizing radiation in our peacetime environment, and the Committee hopes that the Public Health Service, in the study of reorgnization now in progress, will assure very close liaison with the Atomic Energy Commission for the administration of a program on environmental health. This will involve the cooperation of the Food and Drug Administration, the many divisions of the Bureau of State Services, and the National Institutes of Health in which research and control aspects of radiation protection are being carried out.

The educational program of the Atomic Energy Commission through support of special fellowships has played a major role in training investigators in isotope techniques and the entire field of radiobiology. These special fellowships should unquestionably be continued and increased in number, and the teaching of radiobiology in the medical schools, colleges, and universities, and even in the high schools, should be greatly strengthened.

Chapter VI

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE

The total support of medical research through the Department of Health, Education, and Welfare has increased in recent years from $138 million in 1957, when it represented 74 percent of the total medical research expenditures of the Federal Government, to $314 million, or 82 percent, in 1960 (table 3, p. 4). The shift in percentage distribution represents primarily the larger funds appropriated for the National Institutes of Health.

The Committee has concentrated its review on those activities of the Department of Health, Education, and Welfare which are most closely related to research on the dread diseases. Since the Public Health Service carries out 97 percent of the total medical research effort of the Department of Health, Education, and Welfare (table 18), the Committee has for the most part limited its study to that organization with special emphasis on the National Institutes of Health.

TABLE 18.—*Department of Health, Education, and Welfare: Expenditures for medical and health-related research, fiscal years 1958 through 1961*

[In millions of dollars]

	1958		1959 estimate		1960 estimate		President's budget, 1961	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Total, Department of Health, Education, and Welfare	179.7	100.0	236.3	100.0	314.2	100.0	332.1	100.0
Public Health Service	173.2	96.4	228.2	96.6	304.1	96.8	321.4	96.8
Office of Vocational Rehabilitation	3.6	2.0	4.6	1.9	6.3	2.0	7.8	2.3
Food and Drug Administration	1.7	.9	1.9	.8	2.1	.7	2.6	.8
Social Security Administration	1.2	.7	1.6	.7	1.7	.5	[1] .3	.1

[1] Incomplete figure.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (January 1960).

The expenditures of the Public Health Service and its three divisions, the Bureau of State Services, the Bureau of Medical Services, and the National Institutes of Health, for medical and health-related research over the past 3 years are shown in table 19. It can easily be seen that the increase in Public Health Service expenditures from $173.2 million in 1958 to $304 million in 1960 has resulted almost entirely from the increase in appropriations for the National Institutes of Health.

TABLE 19.—*Public Health Service: Expenditures for medical and health-related research, fiscal years 1958 through 1961*

[In millions of dollars]

	1958		1959 estimate		1960 estimate		President's budget, 1961	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Total, Public Health Service	173.2	100.0	228.2	100.0	304.1	100.0	321.4	100.0
National Institutes of Health	157.4	90.9	209.6	91.8	283.8	93.3	297.8	92.7
Bureau of State Services	12.0	6.9	14.5	6.4	16.3	5.3	18.8	5.8
Bureau of Medical Services	1.9	1.1	2.0	.9	2.0	.7	2.1	.7
Office of the Surgeon General	1.9	1.1	2.1	.9	2.0	.7	2.7	.8

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (January 1960).

The Public Health Service is at present engaged in an extensive internal reorganization in order to centralize closely related activities and prevent overlapping functions. The Committee has therefore considered that it would be inappropriate to comment on the programs of the Bureau of State Services and the Bureau of Medical Services at this time. Moreover, since research pertinent to the dread diseases supported by the Public Health Service is carried out almost exclusively by the National Institutes of Health, the activities of these other bureaus are of only peripheral concern to the Committee's survey.

Before turning to a consideration of the National Institutes of Health, however, the Committee would like to take cognizance of the increased emphasis being accorded to problems of environmental health in the reorganization of the Public Health Service and stress the great importance of that field.

Scientists are only beginning to be aware of the enormous role environmental factors are undoubtedly playing in the causation of disease. The foreign substances to which we have become increasingly exposed both internally and externally in the past 20 years have been with us too short a time to indicate what their long-term effects may be. It is safe to assume that not all of them will be good, and we must work hard to obtain knowledge about them before too much damage is done. At the rate new synthetic materials are being put

into use, a truly staggering research program is needed to keep pace. The problems of pollution of our atmosphere and water sources, the special hazards of ionizing radiation, and the complex questions of food additives, all require extensive research programs as a basis for the protective measures which must be introduced and for an understanding of the consequences these factors may have for disease in man. The increasing incidence of lung cancer and leukemia and the apparent increase in early coronary disease may possibly prove to be related to toxic factors with which man comes in frequent contact.

The Committee is therefore greatly concerned that, as a result of the present reorganization of the Public Health Service and the consideration of problems of environmental health by the Congress, an effective organizational structure be developed for the centralization and coordination of the Federal program of research on environmental health. Furthermore, this new pattern of organization should permit rapid application of research findings in this important field and should have authorization for control activities in relation to environmental hazards when necessary.

The tremendous problems of aging and the care of the aged will increase rapidly over the next decade. Research on the aging process and on diseases of the older age group must unquestionably receive greater attention. At present activities related to the health of the older members of our population are scattered in various divisions of the Public Health Service, and the Committee believes there is lack of an effective point of focus for their coordination.

As mentioned earlier, the only way in which medical care can be improved is through medical research and the application of research findings. The activities in the Public Health Service devoted to demonstration and application of research findings are already fairly extensive but, in the opinion of this Committee, they should be still further expanded.

Recommendations:

CHANGES IN ORGANIZATION OF PUBLIC HEALTH SERVICE

In the present study of the reorganization of the Public Health Service, urgent consideration should be given to—

(*a*) Effective centralization and coordination of the Federal programs of research on environmental health;

(*b*) Coordination of activities in progress in the various divisions of the Public Health Service pertaining to research on problems of aging and medical care of the aged; and

(*c*) Strengthening programs of demonstration and application of new research findings.

PART B.—FUTURE PROJECTIONS FOR THE FEDERAL PROGRAM IN SUPPORT OF MEDICAL RESEARCH WITH SPECIAL REFERENCE TO THE NATIONAL INSTITUTES OF HEALTH

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Chapter VII

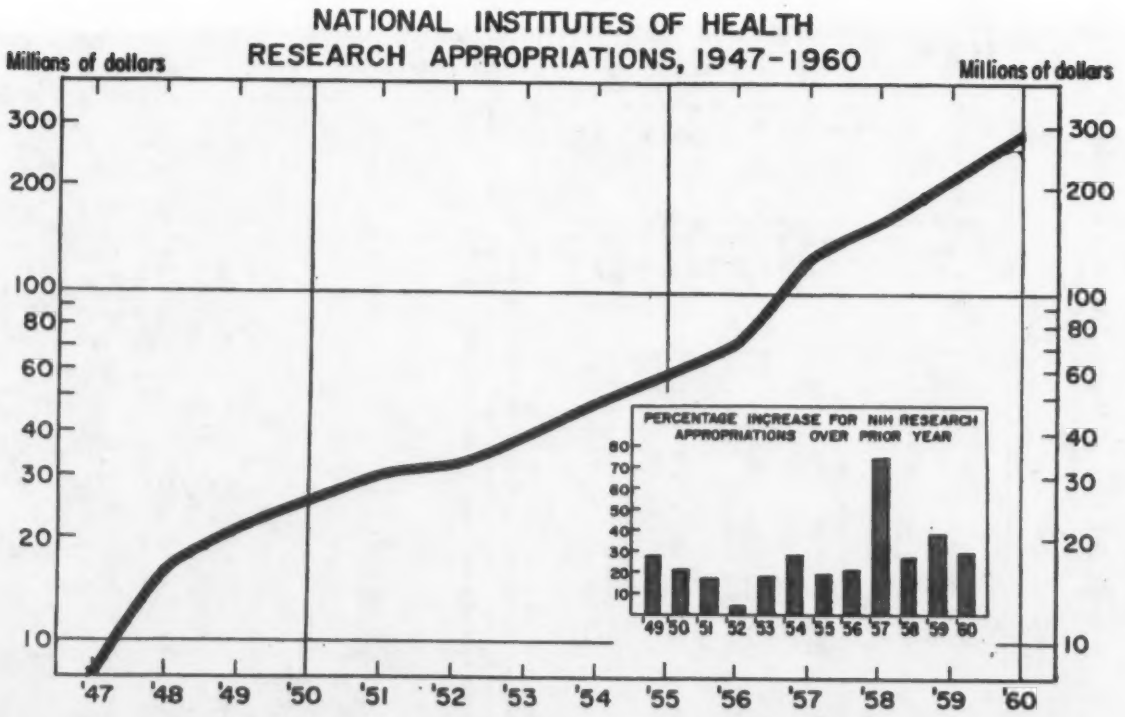
NATIONAL INSTITUTES OF HEALTH

The Committee has reviewed the organization, methods of operation, and the intramural and extramural research programs of the National Institutes of Health and wishes to add its praise to that of all the other professional groups which have studied this organization. The plan, relying on the scientists themselves to govern the disbursement of Federal funds for medical research and training, has proved on the whole remarkably sound, and Federal support through this channel has played a major role in the revolutionary changes in medicine of the past 15 years.

When it is realized that the support of medical research through the National Institutes of Health has been increased as a result of congressional appropriations from $8.4 million in 1947 to an estimated $284 million in 1960 (chart B and table 20), that this represents more than a 30-fold expansion since the immediate postwar period, and that the total budget for the National Institutes of Health has risen from $52.1 to $400 million in the past 10 years (table 21), we have some measure of the support which has been given to Investigators in the medical sciences through this arm of the Federal science program. The great increase in responsibility which has been placed on the National Institutes of Health for the wise administration of these funds has, in the opinion of this Committee, been carried remarkably well.

The success of the National Institutes of Health programs to date can in large measure be attributed to three factors: (1) The National Institutes of Health has been able to attract an unusually dedicated and capable group of people to fill its top positions; (2) the staff has been very wise and extremely careful to avoid any interference with the administration of the research institutions and with the individual investigators; and (3) the National Institutes of Health has been permitted sufficient flexibility to alter its structure and methods of operation in response to the changing demands of medical research. These three factors must continue to hold true in the expanded program which seems inescapable for the National Institutes of Health in the future.

CHART B



Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section.

TABLE 20.—*National Institutes of Health: Medical and health-related research appropriations, 1947–60*

[In millions of dollars]

Fiscal year	Total	Research grants	Intramural research and cancer chemotherapy contracts [1]
1947	8.4	3.4	5.0
1948	16.4	8.9	7.5
1949	21.2	10.9	10.3
1950	25.8	13.1	12.7
1951	30.4	16.8	13.6
1952	32.1	18.2	13.9
1953	38.2	20.4	17.8
1954	48.8	28.9	19.9
1955	58.8	33.9	24.9
1956	71.0	38.3	32.7
1957	125.2	89.7	35.5
1958	157.4	97.7	59.7
1959	209.6	141.5	68.1
1960	283.8	202.9	80.9

[1] Also includes field investigations and administration of research and research grants.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (April 1960).

TABLE 21.—*National Institutes of Health: Appropriations, 1950–60*

[Figures in parentheses not added in totals]

	1950	1951	1952	1953	1954	1955
General research and services, NIH	$12,075,000	$14,313,900	$15,756,500	$16,598,750	$4,675,000	$4,675,000
National Cancer Institute	18,900,000	20,086,000	19,656,750	17,887,000	20,237,000	21,737,000
Mental health activities	[1] 8,606,000	9,505,000	10,561,737	10,895,000	12,095,000	14,147,500
National Heart Institute	10,725,000	14,200,000	10,082,650	12,000,000	15,168,000	16,668,000
Dental health activities	1,780,000	1,954,850	1,617,654	1,650,000	1,740,000	1,990,000
Arthritis and metabolic disease activities [2]				(4,508,900)	7,000,000	8,270,000
Allergy and infectious disease activities [2]				(5,475,200)	5,738,000	6,180,000
Neurology and blindness activities [2]				(1,537,300)	4,500,000	7,600,500
Total	52,146,000	60,059,750	57,675,291	59,030,750	71,153,000	81,268,000

	1956	1957	1958	1959	1960	President's budget, 1961
General research and services, NIH	$5,929,000	$12,122,000	$14,026,000	$28,974,000	$45,994,000	$47,260,000
National Cancer Institute	24,978,000	48,432,000	56,402,000	75,268,000	91,257,000	88,869,000
Mental health activities	18,001,000	35,197,000	39,217,000	52,419,000	68,090,000	67,563,000
National Heart Institute	18,898,000	33,396,000	35,936,000	45,613,000	62,237,000	63,162,000
Dental health activities	2,176,000	6,026,000	6,430,000	7,420,000	10,019,000	11,204,000
Arthritis and metabolic disease activities	10,840,000	15,885,000	20,385,000	31,215,000	46,862,000	47,541,000
Allergy and infectious disease activities	7,775,000	13,299,000	17,400,000	24,071,000	34,054,000	34,739,000
Neurology and blindness activities	9,861,000	18,650,000	21,387,000	29,403,000	41,487,000	39,662,000
Total	98,458,000	183,007,000	211,183,000	294,383,000	400,000,000	400,000,000

[1] Excludes $2,946,000 for support of narcotic hospitals at Lexington and Fort Worth which was subsequently transferred.

[2] The general research and services account included unidentifiable amounts in the initial years of the arthritis and metabolic disease activities, allergy and infectious disease activities, and neurology and blindness activities. Identifiable amounts are shown in the 1953 column for these activities in parentheses. Similarly amounts for the biologics standards activity for 1950–53 are not identifiable and are included in the direct research activity.

Source: U.S. Senate, Committee on Appropriations, Subcommittee on Departments of Labor, and Health, Education, and Welfare. *National Institutes of Health, Appropriations, 1950–60*, Committee Print (Jan. 6, 1960).

Conclusion:

The research grant, training grant, and fellowship programs of the National Institutes of Health over the past 15 years have constituted the most important single force in raising the standard of medical research, teaching, and practice in the United States to its present high level. It is of paramount importance that these programs receive support in proportion to the rate of growth anticipated.

The Committee does not propose to attempt a detailed analysis of the programs of the different institutes, but in the pages immediately following wishes to comment on present needs and future prospects of the National Institutes of Health and on those factors which appear essential for the sound growth of support of medical research and training.

A. ORGANIZATION AND ADMINISTRATION

1. *Institute Status for the Division of General Medical Sciences*

The activities of the Division of General Medical Sciences have grown and matured to the point that its future operation and consideration by Congress require more effective focus. Moreover, it needs a special advisory body which can devote full attention to its varied programs with members selected specifically for their potential contribution to the solution of the Division's problems.

Recommendation:

INSTITUTE STATUS FOR DIVISION OF GENERAL MEDICAL SCIENCES

The Division of General Medical Sciences should be raised to institute status by legislation paralleling the statutory authority of the National Heart Institute, with a name such as "The Institute of Experimental Medicine and Biology," and with its own council, thus relieving the National Advisory Health Council of the specific responsibility of advising in this field.

2. *Consideration of International Medical Activities of the National Institutes of Health*

The Committee believes that the National Institutes of Health must in the future play a much larger role in international medical affairs. There is not now, however, within the National Institutes of Health a sufficient staff or adequate organizational structure for expert consideration of all the problems relating to the activities of the institutes affecting foreign countries, foreign scientists, and international organizations.

Moreover, there is need for special review of foreign research grants by individuals conversant with all the special conditions of support of medical research and education abroad and with the repercussions which may result from the granting of U.S. funds to an investigator in a foreign country.

The Committee believes that the present staff of the Office of International Affairs should be enlarged and accorded appropriate recognition of the important role it will play in the foreign research program of the National Institutes of Health in the future.

Recommendations:

SPECIAL ADMINISTRATIVE UNIT FOR INTERNATIONAL ACTIVITIES

A special administrative unit should be established within the National Institutes of Health for the consideration of all problems relating to the international activities of that organization. This unit should also be responsible for the review of foreign research applications after they have been considered on the basis of scientific merit by the study sections and by the councils of the categorical institutes. It should be staffed by individuals with broad knowledge of the structure of support of medical research and education in foreign countries.

3. *Resources Analysis Section, Office of Program Planning*

The Resources Analysis Section of the Office of Program Planning under the Office of the Director, National Institutes of Health, was created in response to a report of the Senate Appropriations Committee on the 1958 appropriation which directed the National Institutes of Health "to strengthen its analysis of the Nation's total medical research resources."

The staff of this Section has made tremendous strides since 1958. It is now a remarkably authoritative and valuable source of information on the Nation's resources and requirements for medical and health-related research which the Committee found of great help in its present study.

The National Institutes of Health should be encouraged to maintain and strengthen the Office of Program Planning with special reference to the Resources Analysis Section. Moreover, with the increased interest and responsibilities of the National Institutes of Health in international medical affairs, an extension of this activity on an international basis seems desirable.

B. PERSONNEL

Extension of the research and research training activities of the National Institutes of Health has generated policy questions of great importance to medical research and medical education in the United States. The top staff of the National Institutes of Health must have the maturity, experience, and competence to recognize and deal with these questions effectively.

There are today many gaps in the administrative structure of the National Institutes of Health which it has been impossible to fill with highly qualified people. This is partly because the salary levels available either under civil service or in the commissioned corps for the top administrative and research jobs at the National Institutes of Health are no longer in good competitive relation to equivalent positions in acdemic institutions, and are far below salaries available in industry.

This is true notwithstanding the authorization under section 208(g) of the Public Health Service Act which permits payment of salaries under civil service of up to $19,000 per year for a limited number of specially qualified scientific and professional personnel.

Moreover, the dual personnel system under which the National Institutes of Health operates creates difficulties. The civil service system has been modified to attract outstanding people as indicated above. Under the commissioned officer system, however, the number of positions with salaries equivalent to the 208(g) positions, i.e., of general grade, is strictly limited by statute. As a result, competent commissioned officers who are asked to assume positions of heavy responsibility at the National Institutes of Health cannot be promoted in the commissioned corps to a grade warranted by the nature of the position. Since added responsibilities in these situations carry no added reward in terms of rank or salary, commissioned officers who are asked to assume these responsibilities are not given equal recognition to that accorded to their civil service counterparts. Many prefer not to accept the more demanding positions. The discrepancy is especially marked when a top position of responsibility is held by a commissioned corps scientist who does not have an M.D. degree and therefore is not eligible for the incentive pay advantage given to doctors, dentists, and veterinarians in the commissioned corps.

This situation could be rectified by a simple amendment to the section of the Public Health Service Act (sec. 214) which authorizes the detail of officers or employees of the Service to other organizations. A change in the law allowing assignment of a limited number of commissioned officers to the civil service system under a carefully designed and safeguarded plan would permit more effective use of the personnel of the Public Health Service.

The qualifications required for the top administrative and scientific personnel of the National Institutes of Health and for the institute directors, assistant directors, and division chiefs are so high that personnel for these jobs should be selected from the largest manpower pool possible. The Commissioned Corps of the Public Health Service is not large enough to provide men of outstanding ability for the National Institutes of Health and for the competing needs of the Bureau of Medical Services, the Bureau of State Services, and the Office of the Surgeon General.

Recommendations:

(1) INCREASE IN SALARY CEILING AND NUMBER OF POSITIONS FOR SPECIALLY QUALIFIED PERSONNEL

Section 208(g) of the Public Health Service Act should be amended to increase the salary ceiling for specially qualified scientists and professional personnel, and the number of such positions allotted to the National Institutes of Health should be raised substantially, and increased when urgently needed in the future.

(2) ASSIGNMENT OF COMMISSIONED OFFICERS TO CIVIL SERVICE POSITIONS

Section 214 of the Public Health Service Act should be amended to permit assignment of a limited number of commissioned officers to the civil service system in order to encourage competent officers to assume positions of heavy responsibility for which they cannot receive further promotion under the commissioned corps.

(3) RECRUITMENT OF TOP-LEVEL PERSONNEL FROM OUTSIDE THE PUBLIC HEALTH SERVICE

The National Institutes of Health should be encouraged to recruit its top-ranking personnel from outside the commissioned corps of the Public Health Service, as well as from within, in order to be able to select its leaders from the largest possible pool of outstanding scientists with both research experience and talent for administration.

C. SPACE NEEDS AND CONSTRUCTION

One of the most serious deficiencies in the operation of the National Institutes of Health is the lack of adequate office space for the most efficient operation of the present program and for the accommodation of personnel which will be needed in the expansion of the current activities and the development of certain new programs in the future. The present situation in which units of several institutes are scattered in rental space at a considerable distance from the National Institutes of Health campus is extremely expensive, wasteful of the time of consultants and staff, and deterrent to effective collaboration with other sections of the National Institutes of Health. This problem will be only partially remedied by the new office building now under construction. An additional office building is urgently needed.

The National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health at present lack adequate space and facilities for their intramural programs, administration, and planning functions. Their administrative functions could be accommodated in the additional office building proposed, but a new building should be constructed to take care of the intramural research programs of these two institutes.

There is an urgent need at the National Institutes of Health for a facility which will make available to investigators the specialized equipment required by the techniques of physical biology. Such equipment is in general too costly to acquire for a single investigator who might use it only occasionally. The most logical arrangement is therefore to establish a central facility offering all types of equipment for these techniques which would be available for all investigators in the National Institutes of Health who have need of it. It is hoped that similar centers will eventually be constructed in relation to major medical research centers across the country.

If the National Institutes of Health is to play the role in international medical research which this Committee believes it must undertake on behalf of the United States, it should have on the campus a facility in which to house suitably the activities associated with its total international program, with space for working groups and conference rooms of various sizes, some equipped for simultaneous translation. Planning for such a building should begin immediately.

The large animal facility which was approved for the National Institutes of Health in the last session of Congress will prove an exceedingly valuable resource for the research investigators there. This project is expected to require 10 years for completion, but will begin to make its contribution within the next 2 years.

Additional construction urgently needed for which planning has already been completed includes: (1) alterations of animal quarters and the provision of cage washing facilities at the National Institutes of Health; (2) an addition to the clinical center cafeteria; (3) initial construction on the animal farm; and (4) research and animal facilities at Lexington, Ky.

The plans for the future of the National Institutes of Health also call for (1) an expansion of the master utility systems in fiscal year 1962 to supply the needs of new buildings to be constructed on the campus (planning funds are needed for this purpose in fiscal year 1961), and (2) an addition to the Division of Biologics Standards building in a few years for new animal quarters. which will release space required for laboratory activities.

Recommendations:

(1) ADDITIONAL OFFICE SPACE

The urgent need for additional office space should be recognized by authorization and appropriation of the funds for construction of an additional office building at the National Institutes of Health, so that all administrative groups now housed in rental space elsewhere can be brought into more effective relationship with the other segments of the National Institutes of Health with which they must work in close cooperation.

(2) RESEARCH BUILDING FOR THE NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS AND THE NATIONAL INSTITUTE OF MENTAL HEALTH

Funds should be appropriated in the fiscal year 1961 budget for the planning of a new building on the National Institutes of Health campus to serve the intramural research requirements of both the National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health.

(3) PHYSICAL BIOLOGY BUILDING

Authorization should be granted for the construction of a physical biology building which would enable all investigators at the National Institutes of Health to utilize the new techniques of physical biology.

(4) INTERNATIONAL CONFERENCE CENTER

In order to facilitate the exchange of information between scientists of different countries and to support the role of the National Institutes of Health in international medical affairs, authorization should be granted for the planning of an international conference building for the National Institutes of Health. **(See pp. 96–97.)**

(5) ANIMAL FARM

Funds should be appropriated in fiscal year 1961 for initial construction, road improvements, fencing, and for designing and planning of future construction on the animal farm.

(6) OTHER CONSTRUCTION, ALTERATIONS, AND IMPROVEMENTS

Funds should also be appropriated in fiscal year 1961 for (*a*) alterations to the animal quarters at the National Institutes of Health for cage washing facilities and equipment; (*b*) an addition to the clinical center cafeteria; (*c*) research and animal facilities at Lexington, Ky.; and (*d*) for planning and designing the expansion of the master utility systems at the National Institutes of Health to accommodate the buildings to be constructed in the future.

D. INTRAMURAL RESEARCH PROGRAM

The intramural program of the National Institutes of Health has reached a size which is close to the maximum possible for effective operation, and which yet provides, within a convenient geographic radius, competence in all the fields of special knowledge and all the varied skills needed for a truly comprehensive research program on major disease problems. The careful review of the intramural research programs of the different institutes by their respective Boards of Scientific Counsellors is assuring the maintenance of high standards. The additional construction proposed above is needed to increase the efficiency of the present program.

The Committee wishes to pay special tribute to the clinical center at the National Institutes of Health which has so beautifully fulfilled original expectations. The concept of a center for a multidisciplined attack on major disease problems, supported by all the laboratory facilities and special equipment which modern medicine can provide, and with provision of all hospital costs for patients specially selected to further the research missions in progress, has proved to be sound and has served to accelerate progress toward the understanding and treatment of many disease states. The clinical center may be considered the prototype for the general clinical research centers to be described subsequently, although the latter will vary greatly according to the needs of the parent institutions.

Recommendation:

INTRAMURAL RESEARCH PROGRAM

The further growth of the intramural research programs of the National Institutes of Health should be qualitative rather than quantitative. The recruitment and retention of outstanding personnel are therefore essential. Funds will be needed to keep up with the rising costs of research, to provide major improvements in instrumentation and in communication of research knowledge and, in the future, to operate and staff the additional buildings under construction and those proposed.

E. EXTRAMURAL PROGRAM

1. *Research Grants*

On the basis of the experience of the past 15 years, there can be little doubt that new applications for research grants will continue to be received by the National Institutes of Health in increasing numbers and the problem of handling this increase in volume must be given careful consideration.

The excellent reviewing mechanism which has been developed has enlisted the participation of outstanding scientists from the entire country who consider service on the National Institutes of Health study sections and councils to be

an honor and a privilege, a truly educational experience, and a part of their responsibility as scientists. The burden of the increased number of projects to be reviewed, however, is approaching the limit which is reasonable to impose on the members of these advisory groups, on their parent institutions which lose their services while they are in Bethesda, and on the present administrative staff.

Measures must therefore be taken to handle the anticipated increase in volume of research applications through modifications of the present mechanisms and the development of new methods, if the high quality of review is to be maintained.

Recommendations:

(1) ADDITIONAL STUDY SECTIONS

Additional study sections should be established and some of the present study sections should be subdivided when necessary in order to distribute the increasing task of project review. Such subdivisions, however, should not exceed the limit compatible with a comprehensive view of a subject field by the members.

(2) INCREASE IN ADMINISTRATIVE STAFF

The administrative staff should be enlarged to keep pace with the growth in number of grant applications to be reviewed.

(3) NEW ADMINISTRATIVE PATTERNS FOR SUPPORT OF RESEARCH

In order to assure the effective utilization of the larger funds which will be required in the future, new administrative patterns for support of research must be developed. These should be employed according to the needs of the respective institutions.

(a) *Research Centers: General Clinical, Categorical, and Special Research Centers.* The development of clinical research centers, both categorical and noncategorical, and of special research centers based on a specific disease, approach, or resource, will unify the efforts of many investigators in a multidisciplined attack upon disease problems, and will constitute one of the most important opportunities for increasing the productivity of research.

(b) *Institutional Grants.* The return of the responsibility for allocating research and training funds to the research institutions and medical schools of the country in the form of institutional grants will provide greater freedom to the institutions in building up their research services, in stabilizing their research programs, and in establishing additional stable career opportunities.

(c) *Program Grants.* The Consolidation of a number of small grants of an established investigator into a single program grant with long-term support will assure greater stability for the investigator and simplify the requirements of central review.

2. *Training Grants*

Training grants provide one of the most effective mechanisms now in operation for adding to our pool of trained manpower for medical research. It takes several years to build up a training program to its full strength and level of efficiency; many of the current training programs are in their period of rapid growth, and new grants are being started. Therefore, a major increase in the funds required for these programs should be anticipated in the coming year. The best appraisal of the inadequacy of the present level of support is provided by the backlog of approved training grants for which funds will not be available during this fiscal year amounting to $14.3 million.

The training grants have been developed independently in the different institutes in response to very definite needs. They have therefore assumed remarkable variety, and there are now more than 40 different types of training support available through the National Institutes of Health. This is a confusing situation to all concerned.

Recommendations:

(1) INCREASE IN APPROPRIATION FOR TRAINING GRANTS

The appropriation for training activities supported through the National Institutes of Health should be substantially increased in fiscal year 1961 to help provide the trained manpower for teaching and research so urgently needed for the future.

(2) MEDICAL STUDENT RESEARCH TRAINING PROGRAM

A medical student research training program, based on the principles which proved so successful in the experimental training grants, should be established as a stimulus to, and an aid in the support of, research-oriented medical students and college science majors.

(3) CONSOLIDATION OF TRAINING PROGRAMS

The many different training programs should be consolidated, as much as is practicable, into a smaller number of varieties, bringing together under relatively broad guidelines those programs which are very similar in operation and function. The recent localization of responsibility for overall policy and for referral of training grant applications in a separate unit in the Division of Research Grants should prove to be of help in the effort to reduce the complexity of the training grant programs.

(4) ADJUSTMENT OF ALL TRAINING GRANTS TO FORWARD NOTIFICATION BASIS

Funds should be appropriated for fiscal year 1961 in the amount of approximately $23 million to complete the adjustment of both graduate and undergraduate training grants to a forward notification basis, with beginning dates in appropriate relation to the academic year. It should be emphasized that this does not impose any increase in total cost to the Government, but merely alters the time of payment.

3. *Fellowships*

The fellowship programs supported by the National Institutes of Health have made a remarkable contribution to the training of many of the outstanding young medical scientists of the country.

The principle of central review of applicants by outstanding scientists has served extremely well. The Committee believes, however, that the time has come when a part of the responsibility for the selection of fellows should be assumed by their parent institutions on the basis of thorough knowledge of the qualifications of the applicants.

New types of fellowships and increased support of certain fellowship programs should be provided as indicated below:

Recommendations:

(1) PARTICIPATION OF INSTITUTIONS IN THE SELECTION OF NATIONAL INSTITUTES OF HEALTH FELLOWSHIPS

A major portion of the responsibility for selection of fellows under the National Institutes of Health fellowship program should be transferred to the institutions in which the candidates have trained where the awards may be made on the basis of thorough knowledge of the qualifications and needs of the individual candidates.

(2) EXTENSION OF SENIOR FELLOWSHIP PROGRAM TO CLINICAL RESEARCH

Funds should be appropriated to permit extension of the senior fellowship program to include the field of clinical research.

(3) TRAINING FOR ACADEMIC CAREERS

Special fellowships should be provided at the postdoctoral level to support training for a career in academic medicine.

(4) PART-TIME FELLOWSHIPS

The appropriation for part-time fellowships should be increased to give encouragement to, and help provide greater support for, research-oriented medical students.

(5) INCREASE IN NUMBER OF FOREIGN RESEARCH FELLOWSHIPS

The foreign research fellowship program should be increased: (*a*) to permit a modest expansion in the total number of fellowships, (*b*) the inclusion of additional countries as training potential becomes evident, and (*c*) to allow renewal of fellowships for a second year when such extensions are approved by the original nominating committees in the foreign countries and the National Institutes of Health. The growth of this program should be consistent with maintenance of the present high standard of quality of the fellows.

4. *State Control Programs and Community Demonstration Projects*

The Committee believes firmly that all aspects of the Public Health Service program which involve communication and demonstration of the application of new research findings, both to practicing physicians and to the public, should be strengthened and increased.

5. *Collaborative and Cooperative Studies*

The terms "collaborative" and "cooperative studies," as used by the National Institutes of Health, both denote voluntary participation of all component groups, and the development of protocols and operational plans by the participants themselves.

Such studies are in general appropriate only at the applied or developmental end of the spectrum of medical research. They are not meant to substitute for the individual research projects of the investigators, but to complement them, and offer an opportunity to reach an answer more quickly by multiplying the answer one investigator could obtain in a given time alone by the efforts of additional investigators following the same criteria, so that an answer of statistical significance can be obtained within a reasonable time.

The National Institutes of Health currently has three collaborative studies in progress on (1) cancer chemotherapy, (2) psychopharmacology, and (3) the perinatal period. There are two cooperative studies: (1) The aneurysm study, in which the University of Iowa serves as the central processing unit, and (2) the anticoagulant study, in which the Massachusetts General Hospital serves in that capacity.

The cancer chemotherapy program was a pioneering effort without precedent in which it was necessary to experiment with administrative structures and methods of operation. In recent months the entire program has been subjected to intensive scrutiny by the administration and citizen advisers of the National Institutes of Health. On balance, the reviewing groups have concluded that the results of this engineered voluntary cooperative program have been equal to the original concept.

The psychopharmacology program is as yet too recent for fair evaluation. The perinatal program is being subjected to continued internal examination and will be modified in the light of the experience gained.

The consultants can conceive of many future situations in which such programs might have great and culminative importance in the conquest of disease. They therefore wish to commend the National Institutes of Health for initiative and foresight in the present instances, and for keeping these programs under continuous review.

Recommendation:

COLLABORATIVE PROGRAMS

Support of broad collaborative programs should be continued as an effective research technique and new programs should be started when a definite need can be demonstrated. The Committee commends the National Institutes of Health policy of subjecting these programs to continual internal review and periodic evaluation by appropriate groups.

F. HEALTH RESEARCH FACILITIES CONSTRUCTION

The health research facilities construction program, covered under a separate authorization from the rest of the National Institutes of Health, is infusing new life into the research programs of many medical schools, universities, hospitals, and research institutions, and its tremendous value has not been questioned. The need for such facilities is so great that the authority for teh act should definitely be extended.

The chief limitation on the submission of applications has been the difficulty experienced by many schools in raising matching funds. The Committee believes that the principle of matching funds is sound in that it promotes local interest in, and a sense of responsibility for, the facility constructed. The members recognize, however, that matching funds are much more difficult to raise for some schools and in some parts of the country than others and believe that, in situations in which there is a clear and urgent justification for the construction of research facilities, funds should be allocated with some modification of the matching requirement as considered necessary by the National Advisory Council on Health Research Facilities.

Difficulty has also been encountered in differentiating research from research training and teaching in the applications for construction funds. An amendment to broaden the act to include multipurpose facilities construction, when the teaching and research training proposed are directly connected with the research to be carried out, would greatly simplify the administration of the act and permit more economic planning on the part of the applicant institutions. It would also recognize the desirability of flexible use of space and the impossibility of completely divorcing research from research training and teaching. The number of applications for such multipurpose facilities would be expected to exceed considerably that for research facilities alone.

Recommendations;

(1) EXTENSION OF AUTHORIZATION OF HEALTH RESEARCH FACILITIES CONSTRUCTION ACT

The authorization for the Health Research Facilities Construction Act should be extended for a minimum of 5 years beyond its present expiration date.

(2) MODIFICATION OF MATCHING REQUIREMENT IN EXCEPTIONAL CIRCUMSTANCES

In situations in which there is a clear and urgent justification for the construction of health research facilities for which full matching funds cannot be obtained, consideration should be given to modification of the matching requirement.

(3) MULTIPURPOSE FACILITIES CONSTRUCTION

The Health Research Facilities Construction Act should be amended to include multipurpose facilities for research, research training, and health education when the construction is primarily for research and the educational activities are closely related to the research program.

(4) HEALTH EDUCATIONAL FACILITIES CONSTRUCTION

The Committee also endorses pending legislation which would amend the Health Research Facilities Construction Act to authorize a 10-year program of grants for construction of medical, dental, and public health educational facilities. (See Health Educational Facilities Construction, pp. 98–99.)

Chapter VIII

GENERAL CONSIDERATIONS IN PROJECTIONS FOR THE FUTURE

In approaching the problem of adequate budgetary levels in the immediate and more distant future for the Federal program in support of medical research, the Committee has been governed by the recognition that the people of the United States have indicated through their Congress and their voluntary contributions that they truly desire a full-scale attack against the major causes of disease and disability, that they do not wish a lack of funds to delay the answers which can be obtained, and that they are, therefore, willing to support the development of a much more powerful program of medical research than that in operation today. If these premises are accepted, the following considerations seem inescapable:

(1) The level of medical research expenditures each year from Federal and non-Federal sources combined should be sufficient to give adequate support to all research judged to be of high quality and potential productivity by competent scientific advisers after careful and critical review.

(2) Adequate support of such research will require the provision of facilities which will permit the utilization of the new knowledge, equipment, and methods developed by investigators in the physical sciences. Special resource centers must be established on a regional basis which will provide access to electronic and nuclear equipment, data-processing machines, greatly expanded library and communications centers, and specialized animal facilities both to provide the needed types and numbers of animals and to permit such special kinds of experimentation as sterile animal research.

The renovation and new construction of health research facilities and the provision of the full range of research resources appear at present to be among the most urgent requirements for strengthening the base of our medical research program. The need is so great that the development of these facilities should not be delayed by rigid matching fund requirements. The present Federal support of health research facilities construction at a level of $30 million per year is quite out of proportion to the construction requirements of a national medical research effort which is expected to total $715 million this year. The provision of the facilities needed will represent a major capital investment.

(3) There must be a vigorous campaign to increase the number and the degree of training of scientific and supporting personnel for medical research. Intensive recruitment and training efforts will therefore be necessary in medicine and the biological sciences. The financial deterrent to a medical career

must be countered by scholarship and fellowship support, and the health educational facilities must be constructed to permit the expansion in health education capacity which the country will require.

(4) New methods for undertaking research must be developed. The methods and organizational patterns utilized for research in the past will not be adequate for the needs of the future. As the basic sciences have tended to merge at their boundaries and have come to contribute so importantly to medical research, the need for inclusion of representatives of many scientific disciplines in a concerted, multidisciplined attack on disease problems becomes ever more compelling. Special centers must be established to facilitate this kind of approach.

(5) Better methods for supporting research should be developed to assure the maximum of stability and freedom of action both to the institutions and to the individual investigators.

The Committee has considered the economic and manpower resources of our country in relation to the future support of an expanded program of medical research and can see no reason for pessimism over the next decade, barring the occurrence of another war.

These resources were carefully evaluated by the Bayne-Jones committee in 1957–58 and served as the basis for its projection of a total national medical research expenditure of $1 billion by 1970. The reader is referred to the report of that committee for an excellent discussion of these resources. Three factors were underestimated in its projections, however, which can be more accurately evaluated today.

(1) The Bayne-Jones committee recognized that the figures available for medical research expenditures in 1957, the year it selected as the base for projection, were not quite complete and that its projection was probably conservative. It now appears that the value used was approximately 17 percent below the actual level of medical research expenditures for 1957, and the projection made was therefore considerably lower than it should have been.

(2) It was assumed that the proportion of total national expenditures for research and development devoted to medical research would remain constant. This did not take into adequate account the increasing health-consciousness of the American people as expressed in the great expansion in voluntary health and hospital insurance programs, increased demands for assured medical care of the aged, and the growing expectation that the support of medical research will lead to a decrease in disease and disability. Thus, the percentage of total research and development expenditures devoted to medical research has increased from 4 percent in 1957 to 5.3 percent (estimate) in 1960 (table 22).

TABLE 22.—*Growth of Federal program in support of medical and health-related research and National Institutes of Health budget, 1950–60*

[In billions of dollars]

Fiscal year	Gross national product [1]	National research and development [2]		National medical research [3]		Federal medical research [3]		NIH medical research [3]		NIH [4]
		Amount	Percent of gross national product	Amount	Percent of national research and development	Amount	Percent of national medical research	Amount	Percent of Federal medical research	Budget
1950	284.6	2.9	1.0	0.148	5.1	0.060	40.5	0.026	43.3	0.052
1951	329.0	3.4	1.0	.163	4.8	.073	44.8	.030	41.1	.060
1952	347.0	3.8	1.1	.173	4.6	.079	45.7	.032	40.5	.058
1953	365.4	5.2	1.4	.203	3.9	.096	47.3	.038	39.6	.059
1954	363.1	5.6	1.5	.225	4.0	.107	47.6	.049	45.8	.071
1955	397.5	6.4	1.6	.240	3.8	.118	49.2	.059	50.0	.081
1956	419.2	8.5	2.0	.285	3.4	.135	47.4	.071	52.6	.098
1957	442.5	10.0	2.3	.397	4.0	.186	47.0	.125	67.0	.183
1958	441.7	11.2	2.5	.491	4.4	.227	46.0	.157	69.0	.211
1959	478.8	12.4	2.6	.587	4.7	.291	50.0	.210	72.0	.294
1960 (estimated)	500.0	13.5	2.7	.715	5.3	.380	53.0	.284	75.0	.400

[1] Executive Office, *Economic Report of the President transmitted to the Congress, January 20, 1960.*

[2] Department of Defense, Office of the Secretary of Defense. *The Growth of Scientific Research and Development, July 27, 1955,* for the years 1950–52.

National Science Foundation. *Reviews of Data on Research and Development,* for the years 1953–60.

[3] Department of Health, Education, and Welfare, National Institutes of Health, Office of Program Planning, Resources Analysis Section.

[4] U.S. Senate, Committee on Appropriations, Subcommittee on Departments of Labor, and Health, Education, and Welfare. *National Institutes of Health Appropriations, 1950–60,* Committee Print (Jan. 6, 1960).

(3) The assumption was made that the gross national product, the total of all expenditures for goods and services, would rise at an average rate of 3 percent per year which is probably too low. During the past 10 years, the gross national product has increased at an average rate of 3.2 percent per year. The estimation of its growth in the future is fraught with many uncertainties, but many leading economists have stated that by present indications it should increase at a more rapid rate than in the past. With our expanding population, the great increase in the labor force which will occur in the next decade, the increasing productivity possible through the application of automation in industry and agriculture, the contributions of scientific research and the introduction of new machines and methods which will save time, effort, and money, we shall in all probability see a rise in the gross national product to 4 or 5, or even 6 percent per year. Whether one accepts a figure of 4 or 6 percent, the projected increase seems certain to provide a much broader base from which to obtain the funds for a greatly expanded medical research program in the future.

The projection of the Bayne-Jones committee can therefore no longer be considered valid, although the philosophy on which it was based was sound.

The $1 billion level of support for the medical research program of the Nation is likely to be reached much earlier than 1970.

The limitations on scientific manpower for medical research over the next 5 years have been discussed earlier (p. 36), and the conclusion was reached that (1) with the increase in numbers of M.D. and Ph. D. scientists who will become available for careers in medical research during this period; (2) with increasing opportunities for stable and satisfying careers in teaching and research which will attract more of these trained scientists into the field of medical research; (3) with a substantial increase in the number and degree of training of supporting personnel; and (4) with a great increase in the productivity of the individual investigator through new organizational patterns of research and the provision of the necessary research resources, the manpower available for medical research now and in the next 5 years will be sufficient to staff a major expansion of our medical research effort.

It should be emphasized that nothing we can do today will increase the number of M.D. and Ph. D. graduates beyond those already enrolled until 1963. Only if adequate attention is given to the stimulation of interest of high school and college students in the fields of medicine and the biosciences; if the challenge, satisfactions, and rewards of careers in these fields are well presented; and if adequate financial support is provided for medical students, may we look forward to a substantial rise in the number of college graduates applying for medical school and postgraduate training in the biosciences which could begin to be reflected in the number receiving degrees after 1963. By 1970 the number could be substantially increased.

The Resources Analysis Section of the Office of Program Planning, National Institutes of Health, has prepared an interesting chart showing past expenditures for medical research through the National Institutes of Health for 1947–59, and alternative projections for 1960–70 (chart C) based on different assumptions as to the growth of our economy, the percentage of our gross national product devoted to research and development, the percentage of that amount allocated to medical research, and the share supported by the Federal Government and the National Institutes of Health.

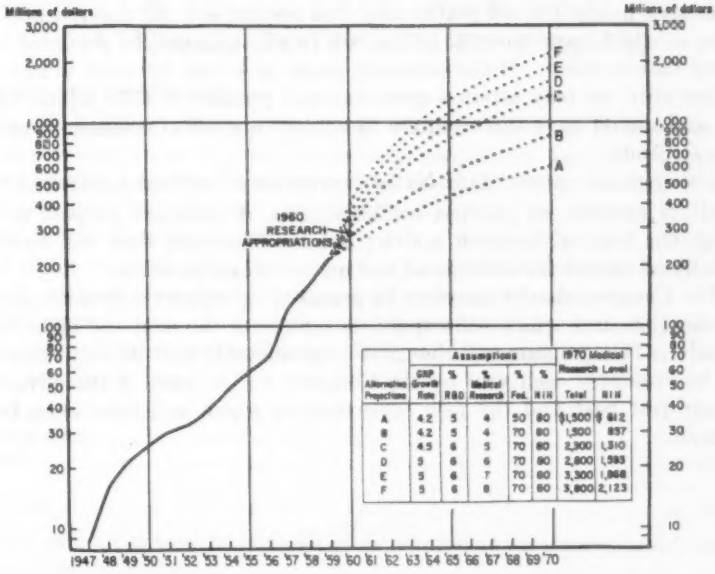
The curve which will actually be followed in the future will depend very largely on the decisions made now and in the years ahead regarding manpower and facilities. These decisions will be influenced by the intensity of the people's demand for better health through research and by the promise of significant breakthroughs which will arise.

The actual budgetary requirements for the future will depend very largely on the present status of medical knowledge which will be the base for new advances and on the steps taken now for the recruitment and training of manpower and the construction of facilities.

Our store of medical knowledge has grown at a staggering rate in the past 20 years and its foundations have been greatly strengthened by the contributions of the basic sciences. The present base seems sufficiently sound to support a major expansion of research effort.

CHART C

NATIONAL INSTITUTES OF HEALTH RESEARCH EXPENDITURES 1947-59
AND ALTERNATIVE PROJECTIONS, 1960-1970



Alternative Projections	Assumptions: GNP Growth Rate	% R&D	% Medical Research	% Fed.	% NIH	1970 Medical Research Level: Total	NIH
A	4.2	5	4	50	80	$1,500	$ 612
B	4.2	5	4	70	80	1,500	857
C	4.5	6	5	70	80	2,300	1,310
D	5	6	6	70	80	2,800	1,595
E	5	6	7	70	80	3,300	1,868
F	5	6	8	70	80	3,800	2,123

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Program Planning, Resources Analysis Section (December 1959).

Assuming that energetic measures are taken promptly to increase our manpower and facilities for medical research, and to support the greatly expanded program possible within our present limitations of manpower and facilities, the Committee foresees the need for much greater Federal appropriations, the greater part of which would be channeled through the National Institutes of Health. Confidence is expressed in the ability of the staff of that organization to administer these larger appropriations wisely. Major infusions of funds into the Federal program through the National Institutes of Health in the past have been readily absorbed and have resulted in a great increase in research potential and performance. There is every reason to expect that this will continue to hold true in the future.

Science, however, has a habit of turning corners, suddenly revealing new horizons which could not have been imagined weeks, or even days, before. The dimensions of the new opportunities awaiting us cannot now be estimated with any accuracy. They may result in major increases and, eventually, in great reductions in the budgetary needs for research. Consequently, the Committee believes that, while alternative projections of future growth provide a useful framework for considering long-range policies, specific projections beyond the year immediately ahead are extremely uncertain, are apt to be misconstrued

as limitations or targets, and impose on any report a kind of built-in obsolescense. It has accordingly limited the scope of its recommendations in the sections to follow.

However, the Committee believes that by 1970 the total support of medical research in the United States may well require annual expenditures of $3 billion, of which more than $2 billion will in all likelihood be provided by the Federal Government. If the economy grows at a rate between 4 and 5 percent per year, we may attain a gross national product of $775 billion by that time, and should have the resources to achieve a medical research program of this magnitude.

Although the nature of the Nation's program of medical research in 1970 is difficult to predict, we can feel confident that, if adequate support is forthcoming, the level of research activity achieved by that time will have substantially advanced the solution of our major disease problems.

The Congress should therefore be prepared to support a dynamic program of medical research which will expand as rapidly as the men and ideas become available. This program will change so unpredictably that its budgetary needs must be evaluated each year by the Congress on the basis of the advances of the year just past and the new opportunities which will have then become apparent.

Chapter IX

COMMENT ON FISCAL YEAR 1960 BUDGET FOR THE NATIONAL INSTITUTES OF HEALTH

A. LEVEL OF SUPPORT

The Committee of Consultants on Medical Research is convinced by abundant evidence that not only is the total support for medical research and training in the United States inadequate for the most effective attack on major disease problems, but also that the part of this support provided by the appropriation for the National Institutes of Health of $400 million [1] is insufficient to pay all of the research grant, training grant, and fellowship applications which will have been recommended for approval in this fiscal year.

The current estimate of applications that will be approved, but not paid due to lack of funds in fiscal year 1960, totals approximately $23 million divided as follows:

Research grants	$3, 000, 000
Training grants	14, 300, 000
Fellowships	5, 500, 000
Total	22, 800, 000

This amount should be considered in relation to an unprogramed reserve of $5,865,000 (table 23).

TABLE 23.—*National Institutes of Health: Analysis of total unprogramed reserve,[1] fiscal year 1960*

National Institutes	Grants	Chemotherapy contracts	Intramural research	Review and approval	Professional and technical assistance	Unprogramed reserve as of Apr. 18, 1960
Cancer Institute	$2, 500, 000	$1, 000, 000	0	0	0	3, 500, 000
Heart Institute	0	0	0	$50, 000	0	50, 000
Arthritis and Metabolic Diseases	1, 000, 000	0	0	50, 000	0	1, 050, 000
Mental Health	0	0	$40, 000	70, 000	$15, 000	125, 000
Neurological Diseases and Blindness	1, 000, 000	0	60, 000	80, 000	0	1, 140, 000
Total	4, 500, 000	1, 000, 000	100, 000	250, 000	15, 000	5, 865, 000

[1] As of Apr. 18, 1960.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Administrative Management, Financial Management Branch (April 1960).

[1] Not including $30 million for health research facilities construction.

B. UNPROGRAMED RESERVE

At the time the final apportionment of funds for fiscal year 1960 was made in September, several of the institute directors could not be sure they would be able to allocate within the fiscal year all the funds appropriated. Therefore, until their needs could be determined, they agreed to set aside from the appropriation for "Research grants" an unprogramed reserve in the amount of $4,500,000 to be held by the Bureau of the Budget. This was divided among the different institutes as shown in table 23. In addition, the sum of $1,365,000, including $1 million of the funds for cancer chemotherapy contracts, was set aside from the appropriation for "Direct operations," making a total unprogramed reserve of $5,865,000.

It now appears that these were fairly good estimates for the institutes which set aside unprogramed reserves, and the appropriation approved by the Congress for research grants for these institutes was in fairly close approximation to the need. The appropriations for some of the other institutes was not sufficient, however, and it is now estimated that the total appropriation for research grants will be $3 million short of the amount needed to pay all approved applications (table 24).

TABLE 24.—*National Institutes of Health: Extramural programs, fiscal year 1960*

National Institutes	Appropriation	Unprogramed reserve [1]	Estimated amount of unpaid approved applications [1]
TRAINING			
Division of General Medical Sciences	$13,040,000		$4,200,000
Cancer Institute	7,205,000		0
Heart Institute	8,679,000		387,190
Allergy and Infectious Diseases	3,621,000		162,785
Arthritis and Metabolic Diseases	6,298,000		1,512,513
Dental Research	1,100,000		69,769
Mental Health	26,206,000		7,670,922
Neurological Diseases and Blindness	8,888,000		297,805
Subtotal	75,037,000	0	14,300,984
FELLOWSHIPS			
Division of General Medical Sciences	5,310,000		2,555,270
Cancer Institute	1,912,000		840,933
Heart Institute	2,663,000		107,878
Allergy and Infectious Diseases	1,066,000		1,125,251
Arthritis and Metabolic Diseases	437,000		575,000
Dental Research	650,000		173,297
Mental Health	1,996,000		0
Neurological Diseases and Blindness	536,000		67,319
Subtotal	14,570,000	0	5,444,948
RESEARCH GRANTS			
Division of General Medical Sciences	23,559,000		754,000
Cancer Institute	37,818,000	[2] $2,500,000	0
Heart Institute	36,468,000		998,000
Allergy and Infectious Diseases	21,569,000		140,000
Arthritis and Metabolic Diseases	31,818,000	1,000,000	420,000
Dental Research	4,476,000		109,000
Mental Health	23,482,000		301,000
Neurological Diseases and Blindness	24,484,000	1,000,000	262,000
Subtotal	[3] 203,674,000	[4] 4,500,000	2,984,000
Total	293,281,000	4,500,000	[5] 22,729,932

[1] As of Apr. 18, 1960.

[2] The National Cancer Institute has an additional unprogramed reserve of $1,000,000 in chemotherapy contracts in "Direct operations."

[3] Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Division of Research Grants.

[4] See table 23 for the total unprogramed reserve of the National Institutes of Health.

[5] Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Office of Administrative Management, Financial Management Branch.

The chief difficulty is that the funds in the unprogramed reserve are earmarked for particular Institutes and specific programs and are therefore unavailable to the Institutes and to the programs most urgently in need of additional funds for research grants. Moreover, they cannot be applied against the $5.5 million deficit for fellowships and the $14.3 million deficit for training grants.

C. ADJUSTMENT OF TRAINING GRANTS TO FORWARD NOTIFICATION BASIS

It has been recognized for some time that the training grant programs of all of the Institutes should have been initiated on an advance notification basis in relation to the academic year so that the personnel planning, both for teachers and trainees on training grants, could be carried out most effectively. This concept is well understood by the Department of Health, Education, and Welfare and by the Bureau of the Budget. Agreement was accordingly reached in the summer of 1959 to remedy this difficult situation over a 3-year period by setting aside a portion of the training grant funds in each of these 3 years and applying it to the adjustment of continuation training grants on a forward notification basis. Accordingly, $8 million was utilized for this purpose in fiscal year 1960, and the balance of the sum required was expected to be made available from the appropriations for fiscal years 1961 and 1962. No allowance for this purpose has been made, however, in the administration budget for fiscal year 1961.

If undergraduate training programs are included, the total additional amount needed to bring all continuation training grants onto a forward notification basis would be $22,700,000.

It should be clear that this adjustment does not really represent any increase in Government expenditures for these approved training programs, but merely advances the date of payment to permit more efficient utilization of funds. This therefore represents a nonrecurring item which, once paid, will not appear in the budgets of future years.

The Committee, therefore, is unable to reconcile the situation outlined above with the statement in the President's budget message in January that "the 1960 appropriation of $400 million for the National Institutes of Health will not be entirely committed this year, even with advanced funding of certain training programs."

Chapter X

FURTHER DEVELOPMENT OF THE PRESENT PROGRAM OF THE NATIONAL INSTITUTES OF HEALTH

A. INTRAMURAL PROGRAM

1. *Direct Operations*

A moderate increment in funds of approximately $11.4 million for the intramural research program, for the Clinical Center, and for the other items listed under Direct Operations is required to cover factors such as the increasing costs of research and its supporting services, the need to purchase new and more expensive equipment, the increased cost of review and approval of a larger volume of grants and fellowships, and an increase in allowance for cancer chemotherapy contracts.

Recommendation:

The appropriation for direct operations should be increased $11.4 million above the appropriation level for fiscal year 1960 to a total of $107 million.

2. *Planning and Construction Funds.*

(a) Funds should be appropriated in fiscal year 1961 for construction as follows:

Alterations to animal quarters, building 14, for cage washing facilities, and washing equipment	$1, 150, 000
Addition to the Clinical Center cafeteria	300, 000
Initial construction on animal farm, road improvements, fencing, etc	250, 000
Research and animal facilities, Lexington, Ky	350, 000
Total	2, 050, 000

(b) Funds needed in fiscal year 1961 for planning of future construction:

Physical biology building (estimated cost, $8 million)	$500,000
Additional office building (estimated cost, $10 million)	700,000
Intramural research building for the National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health (estimated cost, $7 million)	200,000
Buildings for animal farm (total expenditures estimated at $8 million over a 10-year period)	300,000
Master utility systems at the National Institutes of Health to accommodate new buildings to be constructed	610,000
Total	2,310,000

Recommendation:

Appropriations of approximately $4,400,000 for planning and construction should be made for fiscal year 1961.

B. EXTRAMURAL PROGRAM

1. *Research grants*

(a) *Appropriation for fiscal year 1960.* The appropriation for research grants for the National Institutes of Health in fiscal year 1960 was $202,948,000 which included $2 million for primate centers and $3 million for clinical research units. Of this amount $4.5 was withheld as a part of the unprogramed reserve. It now appears that there will be approved applications in the amount of approximately $3 million which cannot be paid out of the funds available for research grants.

In addition, applications were received in the amount of $11 million for primate centers and $8.5 million for clinical research units against the $2 million and $3 million available for these two programs.

(b) *Projection for fiscal year 1961.* An analysis of figures relative to the National Institutes of Health research project awards made over the past 6 years has shown that the continuation grants have constituted an average of 85 percent of the appropriation of the previous year and that supplements to grants have amounted to an additional 5 to 7 percent. A rough calculation of the minimum budgetary requirement for research grants in fiscal year 1961 can be made on this basis.

The research grant appropriation for fiscal year 1960 was $202,948,000. A fair estimate of the cost of continuation grants would be 85 percent of that amount, or $172,500,000. The size of supplemental requests is increasing with the rising costs of research so it seems appropriate to estimate the probable cost of supplements at 7 percent of the appropriation for fiscal year 1960, or a total of $14,200,000. A minimum cost for supporting the continuation of the present grants program would therefore be approximately $186,700,000.

The number of new applications received has increased markedly—from 1,823 in fiscal year 1956 to 5,932 in fiscal year 1960.

The new applications submitted in fiscal year 1960 (5,932 for $129,612,000) exceeded those submitted in fiscal year 1959 (4,856 for $91,598,000) by 22 percent in number and 42 percent in amount.

Assuming a similar increase in new projects for fiscal year 1961 over fiscal year 1960, the new applications in fiscal year 1961 can be expected to reach a dollar total of $184,049,000. If the approval rate continues at a level of about 48 percent, as has obtained over the past 2 years (table 12, p. 28), new research grant applications recommended for approval can be expected to total approximately $88,300,000.

On the basis of these considerations, the Committee believes that a projection of the following order of magnitude for research grants in fiscal year 1961 might be justified:

Estimated continuation grants: 85 percent of fiscal year 1960 appropriation for research grants	$172, 500, 000
Estimated supplemental grants: 7 percent of fiscal year 1960 appropriation for research grants	14, 200, 000
Cost of continuing program	186, 700, 000
New approvals, estimated as 48 percent of the new applications anticipated	88, 300, 000
Projection for research grants in fiscal year 1961	275, 000, 000

The estimated approved research grant applications which will not be paid from fiscal year 1960 funds is expected to be about $3 million which is a little less than the amount of the unprogramed reserve set aside from the research grant appropriation and held by the Bureau of the Budget, and it has, therefore, not been included in this calculation.

(c) *Payment of additional costs incident to the research supported.* If the allowance for payment of research costs on National Institutes of Health research grants is increased, as recommended by this Committee, either by application of the type of cost analysis formula proposed in the Bureau of the Budget circular No. A–21 or by a flat allowance of 25 percent of total direct costs, the additional charge will have to be included in the appropriation for research grants. If one applies a 10 percent increase, as of July 1, 1960, in the costs of research to the $275 million figure calculated above, this would add $23.9 million, and the total for research grants alone would then be $298.9 million. This represents an increase of $97 million, or 48 percent over the appropriation for fiscal year 1960.

Cost of continuation and development of present program	$275, 000, 000
Additional 10 percent allowance for costs of research	23, 900, 000
Projection for fiscal year 1961 for research grants	298, 900, 000

This sum, however, fails to take into account the fact that, as a result of inflation and the greater cost of new kinds of equipment, the average size of new requests is continuing to increase. The average new application in fiscal year 1956 was $13,967, whereas in fiscal year 1960, just 4 years later, it was $21,850, an

increase of over 56 percent, or an average of 14 percent per year. The size of supplements is also increasing though not quite as rapidly.

In the opinion of the Committee, therefore, the figure of approximately $300 million for the National Institutes of Health research grants alone in fiscal year 1961, represents a conservative estimate of budgetary need. This may well prove inadequate if the percentage increase in dollar value of new research applications is greater in 1961 than in 1960 and if the costs of research continue to rise, as they are very likely to do.

Recommendation:

The appropriation for research grants for fiscal year 1961 should be increased to a level which will (*a*) support the continuation projects; (*b*) meet the anticipated increment in approved new applications in fiscal year 1961; (*c*) take care of the approved research grant applications not paid because of lack of funds in fiscal year 1960; (*d*) pay the full additional costs incident to the research program supported, which would represent approximately a 10-percent increase over the present research cost allowance; and (*e*) meet the increased costs of research resulting from inflation. The sum of at least $300 million is recommended.

2. *Training Grant Program*

In connection with the training grant program discussed on page 69, the Committee would like to emphasize that it takes several years to build up a training program to its full strength and level of effectiveness. Many of the current training programs are in their period of rapid growth and new grants are being started. As mentioned earlier in this report, the fiscal year 1960 level of appropriation for training grants is expected to be more than $14 million short for the payment of approved requests received this year, and would be seriously inadequate in fiscal year 1961 to support the good opportunities for training which are now developing. The Committee believes that a realistic estimate of the total appropriation which could be wisely used for training grants would be that indicated below.

Recommendation:

The appropriation for training grants should be increased by approximately $57 million over the level for fiscal year 1960 to a total of $132 million. This would include (*a*) $14 million for training grants which will be approved but unpaid in fiscal year 1960, (*b*) $22,700,000 to complete the adjustment of all continuation training grants to a forward notification basis, and (*c*) approximately $20 million for expansion of the training grant program, including support of research-oriented medical students through undergraduate training and fellowship programs.

3. *Fellowship Program*

The Committee is unanimous in its belief that an increase in the support of both fellowship and training programs will be essential for the development of the teachers to staff the medical schools of the future, and for the training of research investigators for the expansion of our national program of medical research.

In order to support the fellowship program mentioned on page 70, an increase in appropriations over that for fiscal year 1960 will be required.

Recommendation:

The appropriation for fellowships in fiscal year 1961 should be increased by approximately $7.9 million over that for fiscal year 1960 to a total of $22.5 million in order to (*a*) award the fellowships approved but unpaid in fiscal year 1960 which will amount to approximately $5.4 million, (*b*) award new fellowships from a list of applicants expected to exceed considerably the number received last year, (*c*) expand the senior fellowship program to include the field of clinical research, (*d*) develop special fellowships in preparation for careers in academic medicine, (*e*) increase the number of part-time fellowships to give encouragement and support to research-oriented medical students, and (*f*) increase the number of foreign fellowships.

4. *State Control Programs and Community Demonstration Projects*

Recommendation:

The appropriation for State control programs and community demonstration projects should be raised from $11,875,000 to approximately $15 million, an increase of $3,125,000.

C. HEALTH RESEARCH FACILITIES CONSTRUCTION

The Committee believes that health research facilities construction is one of the most urgent needs in the further expansion of our national program in support of medical research, and that the modifications of the Health Research Facilities Construction Act outlined on page 72 should be undertaken promptly.

54568 O—60—pt. 2——16

Recommendation:

If the modifications in the Health Research Facilities Construction Act recommended by this Committee are approved, the authorization for appropriation of funds for health research facilities construction should be increased to a minimum of $50 million per year, with possible future increases in appropriations to be based on the results of annual reappraisal.

Chapter XI

NEW AREAS OF EMPHASIS FOR THE NATIONAL INSTITUTES OF HEALTH PROGRAM

In addition to the anticipated orderly growth of the current program projected on the preceding pages, there are new areas and programs which the Committee believes should receive special attention. Three of these—clinical research centers, primate centers, and international medical research—received some measure of support in fiscal year 1960. Others have received scattered attention in the programs of the various institutes, but these efforts should be amplified and given better coordination in the year ahead. A discussion of these new areas and rough estimates of the funds required for their support are given below.

A. GENERAL AND CATEGORICAL CLINICAL RESEARCH CENTERS

The concept of specialized centers for clinical research has developed rapidly since it was presented to the Congress last year and has been received with great enthusiasm by the medical schools, universities, and research institutes of the country.

A clinical research center, either categorical or noncategorical in orientation, will provide a stable organizational framework in which investigators from all disciplines necessary for a comprehensive attack on disease problems can enter into most effective collaboration, with all necessary diagnostic and research equipment and resources immediately available, and with bed support for the patients while under study. Such a center will permit the most comprehensive, effective, and professionalized research effort possible. The stimulating intellectual environment which will be provided in such a setting will create opportunities for cross-fertilization and germination of ideas which should contribute enormously to our progress in the prevention, diagnosis, and treatment of disease. Application of research findings will be greatly accelerated.

Diversity and flexibility should be prime characteristics of these research centers. Depending on the particular needs of the parent institution, a center may be organized for general clinical research providing the opportunity for intensive investigation of a number of diseases, with facilities for metabolic studies when needed, or it may be devoted to research on a specific disease or organ. In either case, the result will be a pooling of the efforts of doctors and scientists representing the many clinical and preclinical disciplines to be found in a research-oriented hospital and medical school. The centers will for the most part utilize professional manpower already available in medical institutions,

but use it more effectively, and will therefore not divert physicians from teaching or practice. They will in general be established by rearrangement and reorganization of existing space, but new construction on a nonmatching basis may occasionally be necessary.

These centers will be expensive to maintain but will in the long run, through more efficient organization of manpower and facilities, permit remarkable economy of time and funds in relation to the productivity of research.

It would appear that a great need has existed for such clinical centers which was not brought clearly into focus until the current year. Within 3 months after the announcement by the National Institutes of Health to the medical schools of the country that $3 million was available to make a start on this program, 19 applications were received in the amount of $8.5 million.

The Committee is convinced that this program will expand rapidly, but the concept is so new that no one can be certain of the level of support required in the next fiscal year. The experience so far in 1960 has demonstrated that the effective planning of a clinical research center requires a number of months. With the solution of many practical administrative and policy problems during the current year, it is probable that the development of additional centers will proceed more expeditiously in the future, and the Committee estimates that funds in the amount of $55 million could be spent effectively for the establishment of general and categorical clinical research centers in fiscal year 1961. These funds should be appropriated on a 2-year basis so that if most of 1961 is required for planning or if unanticipated delays are encountered, funds unobligated from this appropriation will be available for fiscal year 1962. In the spring of 1961 a careful appraisal should be made of the progress in this program and the needs which have become apparent. In all probability the program will gather momentum and substantially larger amounts should be anticipated for the financing of centers in fiscal year 1962 and thereafter.

The general and categorical clinical research centers could be supported through the existing grants program with special financial provision, or they could be handled by the contract mechanism. Confidence is expressed in the ability of the National Institutes of Health to develop the mechanisms required to meet the demands of this new opportunity. In the interest of the most effective use of funds, appropriate authority should be given to the administration of the National Institutes of Health to transfer funds from the categorical centers to the general clinical centers when the need for the latter exceeds the need in the categorical areas, as evidenced by approved applications.

It is the opinion of the Committee that implementation of the center concept will represent a truly great advance toward the health goals of our people.

Recommendation:

ESTABLISHMENT OF GENERAL AND CATEGORICAL CLINICAL RESEARCH CENTERS

Funds for general and categorical clinical research centers should be provided in the approximate amount of $55 million on a 2-year basis in fiscal year 1961, with sums for future years to be determined next spring after greater experience with the number and variety of applications for such facilities is available. The amount recommended above represents an increase of $52 million over the $3 million included in the budget under research grants in fiscal year 1960.

B. PRIMATE CENTERS AND OTHER ANIMAL RESOURCES

The great interest shown in the development of primate centers in relation to the $2 million appropriated by Congress last year has been an indication of the need for such facilities by the medical investigators in this country. Twelve requests in the amount of approximately $11 million were received for the $2 million available. It will be possible to support only one of these projects with the funds appropriated for fiscal year 1960. The other eleven have been deferred for reconsideration if additional funds become available in fiscal year 1961. It seems evident that there is a great need for additional primate facilities in the United States, and the establishment of a national primate station should receive serious consideration. The Committee believes that the appropriation for primate centers and a primate station should be substantially increased.

There is, however, an equal or more urgent need for improved animal facilities over the entire country. Much research is actually being delayed or impeded because of the lack of experimental animals of various kinds in a reliable state of nutrition and freedom from disease or with a known genetic background. New facilities should be built and more people trained to staff them.

Recommendation:

PRIMATE CENTERS AND ANIMAL RESOURCES

Funds should be appropriated in the approximate amount of $12 million to support the development of outstanding facilities for the production of laboratory animals, for primate research centers, and for the development of a primate station. This represents an increase of $10 million over the $2 million included for this purpose under research grants in the budget for fiscal year 1960.

C. SUPPORT OF MEDICAL LIBRARIES IN RELATION TO RESEARCH

One urgent need almost all medical schools have in common is the improvement of their libraries which are essential to the functions of education, research, and good medical care. The school administrators have not considered it possible to spare sufficient general operating funds for this purpose, and support by private gifts has been meager. Not only do library facilities need to be modernized, and books and periodicals purchased to a more comprehensive level, but completely new libraries will have to be established for the additional medical schools to be built.

Recommendation:

(1) MODERNIZATION AND SUPPLEMENTATION OF MEDICAL LIBRARIES

Funds should be appropriated in fiscal year 1961 in the amount of $5 million to support the modernization and supplementation of medical libraries.

(2) RENOVATION AND CONSTRUCTION OF LIBRARY FACILITIES

Funds for renovation and construction of library facilities should be sought through the health research facilities construction program or, if health educational facilities construction is added, through this joint program.

D. COMMUNICATIONS RESEARCH AND TRANSLATION

The general problem of scientific communication is one of the areas in which the National Institutes of Health has failed to exert leadership. The enormous problems of handling the rapidly increasing flow of new information in the literature, of codifying it and making it readily accessible urgently cry out for solution. It is now virtually impossible for any investigator to keep up with all the reports of interest and pertinence to his own work which are appearing in the literature, and many find themselves seriously handicapped, or engaged in unnecessary duplication because of this difficulty and publication delays. New methods of processing, publishing, and distributing information should be under active study in order to develop ways and means of presenting such material to medical teachers, research investigators, and practicing physicians in the most effective manner possible. Consideration should be given to the greatest possible application of digital computers and other electronic equipment, of photographic methods of reproduction, the development of abstract journals and services, noncommercial medical newspapers, and the use of radio, television, and other methods of communication. New methods and facilities for translation of foreign literature should also be supported.

Recommendations:

(1) SUPPORT OF COMMUNICATIONS RESEARCH

Funds should be appropriated in the approximate amount of $4.5 million to support a greatly increased research effort on methods of data processing, literature analysis, and information retrieval in both the intramural and extramural programs of the National Institutes of Health in close collaboration with the National Library of Medicine.

(2) DISSEMINATION OF FINDINGS OF MEDICAL RESEARCH

The National Institutes of Health should also undertake a thorough study of ways and means to bring to the attention of both research and practicing physicians new medical knowledge and techniques, presented in the most objective form possible and on the basis of the best informed opinion available.

E. INSTRUMENTATION RESEARCH

The remarkable developments in the physical sciences over the past 15 years have provided new tools and techniques permitting tremendous precision and speed of measurement, and new methods of analysis and processing of data which have only begun to be applied to medical research. There is a wide gap between these two areas of science which must be bridged by greater knowledge and understanding and the development of a common language for professional workers in both fields. The practical applications to medicine of new methods and equipment, including electronic and atomic techniques, digital computers, etc., provide challenging possibilities with great promise in measurement, record taking and processing, analysis, and diagnosis. Delay in implementing these possibilities has to a large extent been due to the fact that many of the new facilities and items of equipment involved are large, complex, costly, require specially trained personnel to operate, and are generally impractical for development in relation to any individual research project. Such facilities should be developed on a geographic basis in relation to large medical research centers and should be available to investigators working in various fields.

Recommendation:

SUPPORT OF INSTRUMENTATION RESEARCH

Funds should be appropriated in the approximate amount of $5 million to initiate the establishment of centers on a regional basis in which the new developments in the physical sciences permitting increased speed, accuracy, and complexity of measurement can be applied to medicine.

F. OPPORTUNITIES FOR STABLE ACADEMIC CAREERS

The training grant and fellowship programs of the National Institutes of Health, the National Science Foundation, private foundations and voluntary health agencies have greatly increased our pool of trained manpower for medical research. One great deficit at present is the lack of enough stable career opportunities at satisfactory salary levels in academic medicine to hold young men beyond the period covered by training grants and fellowships. This Committee believes that at present too many men with great research ability become discouraged by the financial insecurity of low level faculty positions without tenure and leave academic medicine and research to go into practice.

Recommendation:

GRANTS TO SCHOOLS TO INCREASE OPPORTUNITIES FOR STABLE ACADEMIC CAREERS

Funds should be provided through the National Institutes of Health in fiscal year 1961 to support the establishment of 200 research professorships in medical and dental schools and the basic science departments of colleges and universities at a salary level of $20,000 a year, the funds to be made available to, and administered by, the respective institutions.

G. INTERNATIONAL MEDICAL RESEARCH

The dread diseases know no geographic boundaries and the research on these great problems should therefore be truly international. The contribution which talented scientists abroad can make in this field has been severely limited in many cases by lack of funds. The Committee believes that the efforts of these foreign investigators should be enlisted in the fight on major disease problems to the greatest extent possible.

The present support of research grants to investigators in foreign countries is carried out through the categorical institutes and the Division of General Medical Sciences. Approximately $3 million will be expended for such projects in fiscal year 1960. For most of these, the principal criterion governing award has been that the research proposed, because of factors of geography, population, disease incidence, disease vectors, etc., could not be carried out as satisfactorily within the United States. However, many foreign investigators have important creative ideas and talent to contribute to the attack on major disease, and less restricted support is important if their help is to be obtained. The Committee recommends an increase in total level of support of foreign research grants through the categorical institutes to $10 million, an increase of $7 million over the level for fiscal year 1960. These funds should be awarded by the National Institutes of Health after critical scientific evaluation by study

sections and councils and after subsequent special review by an administrative unit for the international medical activities of the National Institutes of Health, such as that proposed on pages 61–62. The National Institutes of Health should supplement the support given outstanding foreign investigators by their native countries when this is inadequate, and when United States funds can be given without disturbing the structure of support of scientific research in the foreign countries involved. In this effort close collaboration should be fostered with such international organizations as the World Health Organization and the Pan American Sanitary Bureau.

The exchange of information and opinions on medical research between scientists of different countries is one of the firmest bases on which to build bridges of international cooperation and understanding. This has so far offered the best hope in our relationships with countries behind the Iron Curtain, as the success of the cultural exchange missions in the medical field has shown. The Committee believes that these exchanges should continue and be extended under the auspices of the Public Health Service.

In addition, they believe that the National Institutes of Health has a responsibility to exert forceful leadership in promoting the exchange of medical research information and in affording opportunities for medical scientists of different countries to meet together under suitable circumstances on subjects of international interest and concern.

In spite of the extensive participation of the United States in international medical affairs and the desirability and probability that this involvement will increase, there is no place in the United States available for the efficient conduct of medical meetings, symposia, and working seminars attended by nationals of different countries. While the National Institutes of Health is a medical research center which attracts hundreds of people from foreign countries every year, it has no facilities equipped for simultaneous translation and suitable conduct of this important aspect of medical research. As a consequence, full advantage cannot be taken of the knowledge of many experts who lack the ability to present lectures and participate in give-and-take discussions in the English language. An international medical research facility, equipped for simultaneous translation of conferences, with rooms of different sizes for various working groups, lounges for informal discussion, a cafeteria, and dormitory-type bedrooms for visiting scientists would not only serve an urgent operating need, but would also be a symbol of the participation and leadership of this country in international medical affairs.

Recommendations:

(1) SUPPORT OF INTERNATIONAL MEDICAL RESEARCH

Research in foreign countries as a resource in the attack on the dread diseases should be supported by the National Institutes of Health after scientific evaluation through the accepted mechanisms of review, with subsequent special consideration by a group with broad knowledge of the structure of support of medical research abroad. The amount of such support should be raised to a level of approximately $10 million in fiscal year 1961 and should be increased in subsequent years as the administrative structure can be developed to handle the special problems involved.

(2) DEVELOPMENT OF INTERNATIONAL MEDICAL CONFERENCE CENTER AT THE NATIONAL INSTITUTES OF HEALTH

Careful consideration should be given to the planning of an international medical conference building on the National Institutes of Health campus which would serve as a center for international medical activities. This facility should provide for a large auditorium and smaller meeting rooms with simultaneous translation facilities, lounges, dining facilities, and dormitory-type bedrooms for visiting scientists. The building could also include offices for those directly concerned with the administration of international medical research affairs of the National Institutes of Health.

H. HEALTH EDUCATIONAL FACILITIES CONSTRUCTION

The compelling need for the renovation and expansion of the facilities of existing medical and dental schools and for the construction of new ones, as recommended in the Bane report, cannot be denied. It is apparent that neither the States nor private philanthropy can finance all of the medical and dental school construction required, and it is therefore imperative that the Federal Government take partial responsibility for the construction of the additional facilities which are absolutely essential for the training of physicians and dentists for the future.

Legislation has already been introduced in Congress which would amend the Health Research Facilities Construction Act to include health educational facilities construction and which would authorize to be appropriated:

(1) $50 million per year for each of 5 years for the expansion and improvement of existing schools;

(2) $100 million over a 10-year period for the construction of new schools; and

(3) Grants not to exceed $25,000 for preparing initial plans and estimates.

The grants for health educational facilities construction under this measure would be administered by the National Advisory Council on Health Research Facilities.

The Committee has heard testimony to the effect that many of the existing schools are urgently in need of both renovation and new construction. Many seem to have exhausted their sources of matching funds in order to build new health research buildings and are very doubtful that they can raise additional sums for health educational facilities to the extent required in the proposed bill. The Committee believes that the need for health educational facilities in which to train the physicians needed for our expanding population is so great that adherence to a rigid matching formula would be unwise and is pleased that this has been recognized in the pending legislation by permitting the Federal share to rise to 66⅔ percent of the total for that part of the construction attributable to expanded capacity for freshman enrollment.

The Committee believes, however, that the Congress is interested in quality as well as quantity of physicians. It understands the point of view in some schools which think that they should not, or cannot, expand enrollment and yet urgently require funds for renovation and new construction in order to give the best possible modern medical education to their students, interns, and residents. It is much more difficult to raise funds for renovation of old buildings than for new construction, and the Committee believes therefore that for such construction, also, a graduated matching formula should be used, even if freshman enrollment will not be increased thereby. Consideration should also be given to federally guaranteed long-term, low-interest loans for school construction.

Recommendation:

AMENDMENT OF THE HEALTH RESEARCH FACILITIES CONSTRUCTION ACT TO INCLUDE HEALTH EDUCATIONAL FACILITIES

The Health Research Facilities Construction Act should be amended to include health educational facilities construction with the appropriation of additional funds recommended in pending legislation as follows:

(1) $50 million per year for 5 years to cover expansion and improvement of existing schools;

(2) $100 million to be allocated over a 10-year period for the construction of new schools, with the limit of Federal participation raised to 66⅔ percent of the cost; and

(3) Grants not to exceed $25,000 for preparing initial plans and estimates.

An appropriation of $60 million for fiscal year 1961 is recommended to initiate a program for the construction of health educational facilities.

Chapter XII

SUMMARY OF PROJECTIONS FOR THE FISCAL YEAR 1961 BUDGET OF THE NATIONAL INSTITUTES OF HEALTH

The Committee has reviewed the present needs and future prospects of the National Institutes of Health and the great contribution its programs are making to the health of the American people. A summary of its conclusions as to the general magnitude of budgetary needs in fiscal year 1961 is presented in the following tables. This includes the amount required for the continuation and orderly growth of the present program, and for the development of new areas of emphasis which the Committee believes should be more generously supported in the future.

TABLE 25.—*Projection: Continuation and development of the National Institutes of Health program*

[In thousands of dollars]

	Fiscal year 1960	Recommended for fiscal year 1961	Increase
Direct operations (intramural)	95, 570	107, 000	11, 430
Grants (extramural):			
1. Research grants	[1] 202, 948	[2] 300, 000	97, 052
2. Research fellowships	14, 570	22, 500	7, 930
3. Training grants	75, 037	132, 000	56, 963
4. State control and community demonstration program	11, 875	15, 000	3, 125
Total, grants	304, 430	469, 500	165, 070
Total for continuation and development of present program	400, 000	576, 500	176, 500
Intramural construction and planning	300	4, 400	4, 100
Health research facilities construction	30, 000	50, 000	20, 000

[1] This amount includes: $3 million for clinical research units; $2 million for primate centers; and $3 million for international medical research.

[2] This amount includes continuation of the three items listed under footnote (1) at approximately the fiscal year 1960 level.

The Committee believes that the amounts listed below are fair estimates of the funds that could be wisely used in fiscal year 1961 for the new areas of emphasis which have been recommended.

TABLE 26.—*Projection: New areas of emphasis for the National Institutes of Health program*

[In thousands of dollars]

	Fiscal year 1960	Recommended for fiscal year 1961	Increase
General and categorical clinical research centers	[1] (3, 000)	[2] 55, 000	52, 000
Primate centers and other animal resources	[1] (2, 000)	[2] 12, 000	10, 000
Support of medical libraries in relation to research		5, 000	5, 000
Communications research and translation		4, 500	4, 500
Instrumentation research		5, 000	5, 000
Additional opportunities for stable academic careers		4, 000	4, 000
International medical research	[1] (3, 000)	[2] 10, 000	7, 000
Total		95, 500	87, 500
Health educational facilities construction		[3] 60, 000	60, 000

[1] This amount is included under research grants in table 25 as part of the fiscal year 1960 program.

[2] The equivalent of the 1960 level for these activities is included in the fiscal year 1961 projection of the present program in table 25.

[3] This should be appropriated under an amendment to the Health Research Facilities Construction Act.

SUMMARY OF PROJECTIONS FOR FISCAL YEAR 1961 FOR THE NATIONAL INSTITUTES OF HEALTH

The Committee believes that the National Institutes of Health could utilize effectively in fiscal year 1961 the total amounts shown below for the further development of the present program and for the new areas of emphasis proposed.

	Fiscal year 1960	Committee's recommendation for fiscal year 1961	Increase
Continuation and development of present program	$400,000,000	$576,500,000	$176,500,000
Increase for new areas of emphasis		87,500,000	87,500,000
Total	400,000,000	664,000,000	264,000,000

In addition, the Committee would add under separate appropriations:

	Fiscal year 1960	Committee's recommendation for fiscal year 1961	Increase
Intramural planning and construction	$300,000	$4,400,000	$4,100,000
Health research facilities construction	30,000,000	50,000,000	20,000,000
Health educational facilities construction		60,000,000	60,000,000

Recommendations:

A total budget for the National Institutes of Health for fiscal year 1961 of approximately $664 million should be considered a reasonable estimate of the funds which could be wisely and usefully expended through the National Institutes of Health for the attack on major disease problems during the coming year, provided adequate time is allowed for planning and staffing new programs. This represents an increase of $264 million over the budget for fiscal year 1960.

To this should be added under separate appropriations $4.4 million for intramural planning and construction, $50 million for health research facilities construction, and $60 million to initiate a program of health educational facilities construction.

This level of support would assure the effective utilization of the Nation's present potential for medical research and would allow the growth which this Committee believes necessary. The appropriation of less than the amount suggested may mean a consequent postponement of the time when answers to major disease problems could become available.

TABLE 27.—*Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health: Fiscal year 1961 budget estimate of Committee of Consultants on Medical Research*

[In thousands]

Activity	GRS-NIH	NIAMD	NIAID	NINDB	NCI	NIMH	NHI	NIDR	Fiscal year 1961 total	Fiscal year 1960 total
CONTINUATION AND DEVELOPMENT OF PRESENT PROGRAMS										
GRANTS										
Research projects	$40,000	$43,000	$30,500	$37,000	$46,000	$37,000	$59,500	$7,000	[1] $300,000	[1] $202,948
Research fellowships	9,100	800	1,250	700	2,900	2,850	4,000	900	22,500	14,570
Training	30,000	12,700	5,000	10,765	9,200	45,000	16,370	2,965	[2] 132,000	75,037
State control programs					2,425	6,500	3,375		12,300	10,375
Community demonstration projects					2,700				2,700	1,500
Total grants	79,100	56,500	36,750	48,465	63,225	91,350	83,245	10,865	469,500	304,430
DIRECT OPERATIONS										
Research		8,990	7,935	7,495	13,195	8,300	8,360	2,525	56,800	49,885
Biologics standards	2,745								2,745	2,805
Review and approval	1,670	890	580	1,100	1,385	1,675	1,295	280	8,875	7,076
Training activities				60		200	185		445	335
Professional and technical assistance					5,865	2,230	2,300	1,330	11,725	10,786
Chemotherapy contracts					23,140				23,140	22,142
Dental resources								1,080	1,080	772
Administration		200	189	260	520	655	246	120	2,190	1,769
Total direct operations	4,415	10,080	8,704	8,915	44,105	13,060	12,386	5,335	107,000	95,570
Total continuation and development of present programs	83,515	66,580	45,454	57,380	107,330	104,410	95,631	16,200	576,500	400,000

DEVELOPMENT OF NEW AREAS OF EMPHASIS										
Additional general and categorical clinical research centers	17,000	1,000	500	1,500	15,000	2,000	15,000	.....	[3] 52,000	[3] 3,000
Additional primate centers and other animal resources (increase)	.....	.....	.....	.....	.....	.....	10,000	.....	[4] 10,000	[3] 2,000
Support of medical libraries in relation to research	650	700	550	600	800	600	1,000	100	5,000	.....
Communications research and translation	630	540	360	450	855	810	765	90	4,500	.....
Instrumentation research	700	600	400	500	950	900	850	100	5,000	.....
Additional opportunities for stable academic careers	1,000	360	200	280	320	1,240	520	80	4,000	.....
International medical research, increase	910	980	770	840	1,120	840	1,400	140	7,000	.....
Total increase for development of new areas of emphasis	20,890	4,180	2,780	4,170	19,045	6,390	29,535	510	87,500	.....
Total estimate for the National Institutes of Health	104,405	70,760	48,234	61,550	126,375	110,800	125,166	16,710	664,000	.....
OTHER PUBLIC HEALTH SERVICE APPROPRIATIONS										
Intramural planning and construction	.....	.....	.....	.....	.....	.....	.....	.....	4,400	300

TABLE 27.—*Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health: Fiscal year 1961 budget estimate of Committee of Consultants on Medical Research*—Continued

(In thousands

Activity	GRS-NIH	NIAMD	NIAID	NINDB	NCI	NIMH	NHI	NIDR	Fiscal year 1961 total	Fiscal year 1960 total
OTHER PUBLIC HEALTH SERVICE APPROPRIATIONS—Continued										
Health research facilities construction									$50,000	$30,000
Health educational facilities construction									60,000	

[1] Includes: (1) Clinical research units (therapeutic and metabolic), $3,000,000; (2) primate centers, $2,000,000; and international medical research, $3,000,000.

[2] Includes adjustment of $22,739,236 for forward notification.

[3] Excludes $3,000,000 for clinical research units (metabolic and therapeutic) included in 1 above.

[4] Excludes $2,000,000 for primate centers included in 1 above.

[5] Included in the amount of $202,948,000, above, for research projects.

Chapter XIII

CONCLUSIONS AND RECOMMENDATIONS OF THE COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

I. Adequacy of Federal Support of Medical Research

The funds appropriated by the Congress for the support of medical research, although substantial, are still not sufficient to assure the full utilization of the Nation's potential for an attack on the dread diseases, and the present level of support is far from adequate to permit the great advances essential for the future (p. 5).

Recommendation:

Role of Federal Government in Support of Medical Research. The Federal Government should supplement private, industrial, and State funds, as may be necessary, to support medical research on the scale required to carry out a determined attack on major health problems. The magnitude of Federal support should be neither limited by, nor paced by, the rate of increase of non-Federal sources of support (p. 6).

II. Effectiveness of Utilization of Federal Funds Appropriated for Medical Research

Considering the program as a whole, the funds appropriated by the Congress for the support of research on major disease problems have been efficiently spent in the best interests of the research for which they were designated (p. 9).

Recommendation:

(1) *New Administrative Patterns for Support of Research.* For the effective allocation of the larger funds which will be required in the future, new administrative patterns for the support of research must be employed. These will include institutional grants, program grants, and large grants to clinical research and special resource centers.

(2) *Method of Appropriation for New Programs.* In order to assure the highest efficiency of utilization of funds for new programs and those requiring a long lead time for effective planning, Congress should give serious consideration to granting funds on a 2-year basis (or more) when making appropriations for such purposes (p. 9).

III. Impact of the Expanding Federal Program in Support of Medical Research

A. EFFECT ON MEDICAL SCHOOLS

Recommendations:

Construction of Health Educational Facilities. The Federal Government should supplement the efforts of the States and of private sources to meet the construction needs of our public and nonprofit medical, dental, and public health schools by appropriating funds on a matching basis for:

(a) Improvement and/or expansion of existing schools of medicine, dentistry, and public health;

(b) New 2-year schools of basic medical sciences;

(c) New 4-year schools; and

(d) The necessary teaching hospitals (p. 15).

Payment of Full Costs of Research. The National Institutes of Health should be authorized to allow a realistic amount for the costs of research directly related to the program supported. This could be provided in either of the following ways, listed in order of preference:

(1) Full costs as determined by a cost analysis formula (such as that proposed in the Bureau of the Budget Circular No. A–21), or

(2) Twenty-five percent of total direct costs except for those institutions which have formally established lower rates on the basis of audit by a Federal agency (the average figure for medical schools audited under the "Blue Book Formula," reported to the National Science Foundation in its 1957–58 survey was 25.1 percent) (p. 18).

Institutional Grants. The Public Health Service should be permitted by law to make institutional grants, upon recommendation of the appropriate council of the National Institutes of Health, to public or nonprofit universities, hospitals, laboratories, research institutes, and other institutions, for the general support of their medical research and research training programs.

The proposed limit on such grants to 15 percent of the total research grant appropriation should be removed, and the relation of institutional grants to the total research grant program should be administratively determined. The current highly effective project grants should continue as a major method for the support of research (p. 20).

B. EFFECT ON MEDICAL PRACTICE

The contribution of medical research to medical practice in terms of new knowledge, techniques, and methods of patient care has been a prime factor in the increase in effectiveness of the individual physician and in raising the standard of medical care to the highest level ever achieved. This gain has outweighed the developing quantitative shortage of medical manpower (p. 24).

C. EFFECT OF NON-FEDERAL SOURCES OF SUPPORT

The expansion of the Federal program in support of medical research has served as a stimulus, rather than as a deterrent, to non-Federal sources of support (p. 27).

D. EFFECT ON QUALITY OF REVIEW

The increasing annual appropriations for the National Institutes of Health in recent years have been administered with maintenance of the same high standard of review which has been characteristic of that program since its inception. Furthermore, the Committee is convinced that the quality of the research supported has improved (p. 29).

IV. Status of Medical Manpower

A. NUMBER OF PHYSICIANS

Recommendation:

Training of Additional Physicians and Dentists. Measures should be initiated promptly to train greater numbers of physicians and dentists by implementing the recommendations of the Bane committee report (p. 33).

B. RECRUITMENT OF MEDICAL STUDENTS

Recommendations:

(1) *Financial Aid to Medical Students.* The Federal Government should supplement private, industrial, and State sources in providing scholarship, fellowship, and loan assistance to medical and dental students interested in careers of teaching and research, as it now does to Ph. D. candidates in the basic sciences.

(2) *Information on Careers in the Medical Sciences.* Greater effort should be made through the schools and the various media of communication to inform more young people of the opportunities for service and the challenge, satisfactions, and rewards of careers in medicine, dentistry, and public health (p. 36).

C. MANPOWER FOR RESEARCH

The need for more physicians and dentists should not be considered a limitation on the continued expansion of the health research effort of the country at this time. Ph. D. graduates and candidates, now making up approximately one-half of the total professional personnel engaged in health research, together with the support of personnel in the paramedical specialties, technicians and others, assure an adequate manpower base for the continued growth of medical research. Moreover, the use of new instrumentation, techniques, and organizational structures for research can greatly magnify the productivity of the manpower available (p. 38).

V. Government Agencies Other Than the Department of Health, Education, and Welfare

Recommendation:

Diversity of Federal Support for Medical Research. Other Federal agencies besides the National Institutes of Health should continue to maintain strong programs in support of medical research. These programs should not only serve the specific health missions of these agencies and make their operations more effective, but should also utilize their special opportunities to make contributions of particular value to the total medical research effort of the country. The agencies should be given the funds to support both basic and applied research and to sustain both in-service programs and strong extramural programs in support of medical research in non-Federal, nonprofit research institutions (p. 40).

A. DEPARTMENT OF DEFENSE

(1) The maintenance of a strong medical research program, both extramural and intramural, and including basic as well as applied research, is essential to the armed services for the achievement of the following goals:

(a) The acquisition of knowledge necessary for the specific missions of the three armed services;

(b) The maintenance of the highest standards of patient care for military personnel and their dependents in hospitals of the armed services;

(c) The advancement of medical knowledge through the utilization of the opportunities for good research observations under well-controlled conditions with unusual opportunities for followup which the hospitals of the armed services can afford. This is especially important in military hospitals in foreign countries where less familiar disease conditions may occur.

(2) The support of medical research through the Department of Defense has not been sufficient to fulfill adequately the purposes for which this support was given. The armed services represent an important resource for medical research which, primarily because of lack of funds and personnel, is being poorly utilized at the present time (p. 46).

Recommendations:

(1) *Increase in Appropriation for Medical Research by the Army, Navy, and Air Force.* As recommended by the Advisory Panel on Medical Sciences to the Secretary of Defense 3 years ago, the appropriation for medical research in the armed services should be approximately doubled in order to permit the full utilization of the excellent facilities and opportunities for research available in military research institutes and hospitals.

(2) *Increase in Number of Civil Service Positions for the Department of Defense.* The three armed services should be authorized and provided with funds to employ in military hospitals and research institutes a larger number

of civilian scientists and the necessary supporting personnel under civil service, including additional Public Law 313 positions.

(3) *Increased Stability and Level of Support for Extramural Programs of Armed Services.* Sustained and expanded appropriations should be provided for more stable support of the extramural medical research programs of the armed services.

(4) *Use of Bio-Sciences Information Exchange.* The Committee urges all three armed services to give full cooperation to, and utilize the services of, the Bio-Sciences Information Exchange in providing and obtaining information on the support of research, and recommends that they register all research applications when received, as the National Institutes of Health, the Atomic Energy Commission, and the National Science Foundation have done so effectively (p. 47).

B. VETERANS' ADMINISTRATION

The present level of support of medical research in hospitals of the Veterans' Administration is inadequate to permit the full contribution that agency can make to research on the dread diseases (p. 49).

Recommendation:

Increased Appropriation for Veterans' Administration. The appropriation for the Veterans' Administration program of medical research should be substantially increased for 1961 (p. 49).

VI. Department of Health, Education, and Welfare, Public Health Service

Recommendations:

Changes in Organization of Public Health Service. In the present study of the reorganization of the Public Health Service, urgent consideration should be given to:

(a) Effective centralization and coordination of the Federal programs of research on environmental health;

(b) Coordination of activities in progress in the various divisions of the Public Health Service pertaining to research on problems of aging and medical care of the aged; and

(c) Strengthening programs of demonstration and application of new research findings (p. 53).

VII. National Institutes of Health

The research grant, training grant, and fellowship programs of the National Institutes of Health over the past 15 years have constituted the most important single force in raising the standard of medical research, teaching, and practice in the United States to its present high level. It is of paramount importance that these programs receive support in proportion to the rate of growth anticipated (p. 61).

A. ORGANIZATION AND ADMINISTRATION

Recommendations:

Institute Status for Division of General Medical Sciences. The Division of General Medical Sciences should be raised to institute status by legislation paralleling the statutory authority of the National Heart Institute, with a name such as "The Institute of Experimental Medicine and Biology," and with its own council, thus relieving the National Advisory Health Council of the specific responsibility of advising in this field (p. 61).

Special Administrative Unit for International Activities. A special administrative unit should be established within the National Institutes of Health for the consideration of all problems relating to the international activities of that organization. This unit should also be responsible for the review of foreign research applications after they have been considered on the basis of scientific merit by the study sections and by the councils of the categorical institutes. It should be staffed by individuals with broad knowledge of the structure of support of medical research and education in foreign countries (p. 62).

B. PERSONNEL

Recommendations:

(1) *Increase in Salary Ceiling and Number of Positions for Specially Qualified Personnel.* Section 208(g) of the Public Health Service Act should be amended to increase the salary ceiling for specially qualified scientists and professional personnel, and the number of such positions allotted to the National Institutes of Health should be raised substantially, and increased as needed in the future.

(2) *Assignment of Commissioned Officers to Civil Service Positions.* Section 214 of the Public Health Service Act should be amended to permit assignment of a limited number of commissioned officers to the civil service system in order to encourage competent officers to assume positions of heavy responsibility for which they cannot receive further promotion under the commissioned corps.

(3) *Recruitment of Top-Level Personnel from Outside the Public Health Service.* The National Institutes of Health should be encouraged to recruit its top-ranking personnel from outside the commissioned corps of the Public Health Service, as well as from within, in order to be able to select its leaders from the largest possible pool of outstanding scientists with both research experience and talent for administration (p. 64).

C. SPACE NEEDS AND CONSTRUCTION

Recommendations:

(1) *Additional Office Space.* The urgent need for additional office space should be recognized by authorization and appropriation of the funds for construction of an additional office building at the National Institutes of Health, so that all administrative groups now housed in rental space elsewhere can be

brought into more effective relationship with the other segments of the National Institutes of Health with which they must work in close cooperation.

(2) *Research Building for the National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health.* Funds should be appropriated in the fiscal year 1961 budget for the planning of a new building on the National Institutes of Health campus to serve the intramural research requirements of both the National Institute of Neurological Diseases and Blindness and the National Institute of Mental Health.

(3) *Physical Biology Building.* Authorization should be granted for the construction of a physical biology building which would enable all investigators at the National Institutes of Health to utilize the new techniques of physical biology.

(4) *International Conference Center.* In order to facilitate the exchange of information between scientists of different countries and to support the role of the National Institutes of Health in international medical affairs, authorization should be granted for the planning of an international conference building for the National Institutes of Health.

(5) *Animal farm.* Funds should be appropriated in fiscal year 1961 for initial construction, road improvements, fencing, and for designing and planning of future construction on the animal farm.

(6) *Other Construction, Alterations, and Improvements.* Funds should also be appropriated in fiscal year 1961 for (a) alterations to the animal quarters at the National Institutes of Health for cage washing facilities and equipment; (b) an addition to the clinical center cafeteria; (c) research and animal facilities at Lexington, Ky.; and (d) for planning and designing the expansion of the master utility systems at the National Institutes of Health to accommodate the buildings to be constructed in the future (p. 66).

D. INTRAMURAL RESEARCH PROGRAM

Recommendation:

Intramural Research Program. The further growth of the intramural research programs of the National Institutes of Health should be qualitative rather than quantitative. The recruitment and retention of outstanding personnel are therefore essential. Funds will be needed to keep up with the rising costs of research, to provide major improvements in instrumentation and in communication of research knowledge, and in the future, to operate and staff the additional buildings under construction and those proposed (p. 67).

E. EXTRAMURAL PROGRAM

1. *Research Grants*

Recommendations:

(1) *Additional Study Sections.* Additional study sections should be established and some of the present study sections should be subdivided when necessary in order to distribute the increasing task of project review. Such

subdivisions, however, should not exceed the limit compatible with a comprehensive view of a subject field by the members.

(2) *Increase in Administrative Staff.* The administrative staff should be enlarged to keep pace with the growth in number of grant applications to be reviewed.

(3) *New Administrative Patterns for Support of Research.* In order to assure the effective utilization of the larger funds which will be required in the future, new administrative patterns for support of research must be developed. These should be employed according to the needs of the respective institutions.

(a) *Research Centers: General, Clinical, Categorical, and Special Resource Research Centers.* The development of clinical research centers, both categorical and noncategorical, and of special research centers based on a specific disease, approach, or resource, will unify the efforts of many investigators in a multidisciplined attack upon disease problems and will constitute one of the most important opportunities for increasing the productivity of research.

(b) *Institutional Grants.* The return of the responsibility for allocating research and training funds to the research institutions and medical schools of the country in the form of institutional grants will provide greater freedom to the institutions in building up their research services, in stabilizing their research programs, and in establishing additional stable career opportunities.

(c) *Program Grants.* The consolidation of a number of small grants of an established investigator into a single program grant with long-term support will assure greater stability for the investigator and simplify the requirements of central review (p. 68).

2. *Training Grants*

Recommendations:

(1) *Increase in Appropriation for Training Grants.* The appropriation for training activities supported through the National Institutes of Health should be substantially increased in fiscal year 1961 to help provide the trained manpower for teaching and research so urgently needed for the future.

(2) *Medical Student Research Training Program.* A medical student research training program based on the principles which proved so successful in the experimental training grants should be established as a stimulus to, and an aid in the support of, research-oriented medical students and college science majors.

(3) *Consolidation of Training Programs.* The many different training programs should be consolidated, as much as is practicable, into a smaller number of varities, bringing together under relatively broad guidelines those programs which are very similar in operation and function. The recent localization of responsibility for overall policy and for referral of training grant

applications in a separate unit in the Division of Research Grants should prove to be of help in the effort to reduce the complexity of the training grant programs.

(4) *Adjustment of all Training Grants to Forward Notification Basis.* Funds should be appropriated for fiscal year 1961 in the amount of approximately $23 million to complete the adjustment of both graduate and undergraduate training grants to a forward notification basis, with beginning dates in appropriate relation to the academic year. It should be emphasized that this does not impose any increase in total cost to the Government but merely alters the time of payment (p. 69).

3. *Fellowships*

Recommendations:

(1) *Participation of Institutions in the Selection of National Institutes of Health Fellowships.* A major portion of the responsibility for selection of fellows under the National Institutes of Health fellowship program should be transferred to the institutions in which the candidates have trained where the awards may be made on the basis of thorough knowledge of the qualifications and needs of the individual candidates.

(2) *Extension of Senior Fellowship Program to Clinical Research.* Funds should be appropriated to permit extension of the senior fellowship program to include the field of clinical research.

(3) *Training for Academic Careers.* Special fellowships should be provided at the postdoctoral level to support training for a career in academic medicine.

(4) *Part-time Fellowships.* The appropriation for part-time fellowships should be increased to give encouragement to, and help provide greater support for, research-oriented medical students.

(5) *Increase in Number of Foreign Research Fellowships.* The foreign research fellowship program should be increased to permit a modest expansion in the total number of fellowships, the inclusion of additional countries as training potential becomes evident, and to allow renewal of fellowships for a second year when such extensions are approved by the original nominating committees in the foreign countries and the National Institutes of Health. The growth of this program should be consistent with maintenance of the present high standard of quality of the fellows (p. 70).

5. *Collaborative and Cooperative Studies*

Recommendation:

Collaborative Programs. Support of broad collaborative programs should be continued as an effective research technique, and new ones should be started when a definite need can be demonstrated. The Committee commends the National Institutes of Health policy of subjecting these programs to continual internal review and periodic evaluation by appropriate groups (p. 72).

F. HEALTH RESEARCH FACILITIES CONSTRUCTION

Recommendations:

(1) *Extension of Authorization of Health Research Facilities Construction Act.* The authorization for the Health Research Facilities Construction Act should be extended for a minimum of 5 years beyond its present expiration date.

(2) *Modification of Matching Requirement in Exceptional Circumstances.* In situations in which there is a clear and urgent justification for the construction of health research facilities for which full matching funds cannot be obtained, consideration should be given to modification of the matching requirement.

(3) *Multipurpose Facilities Construction.* The Health Research Facilities Construction Act should be amended to include multipurpose facilities for research, research training, and health education when the construction is primarily for research and the educational activities are closely related to the research program.

(4) *Health Educational Facilities Construction.* The Committee also endorses pending legislation which would amend the Health Research Facilities Construction Act to authorize a 10-year program of grants for construction of medical, dental, and public health educational facilities (p. 73).

VIII. Budgetary Projections for the National Institutes of Health for Fiscal Year 1961

The Committee's recommendations for appropriations for fiscal year 1961 are summarized in chapter XII, pages 101–106.

The continuation and development of the present program is estimated to require a total of $576,500,000 (table 25, p. 101).

In addition the Committee recommends new or increased appropriations in the amount of $87,500,000 for seven areas which it believes should receive special emphasis in fiscal year 1961, namely: (1) General and Categorical Clinical Research Centers; (2) Primate Centers and Other Animal Resources; (3) Support of Medical Libraries in Relation to Research; (4) Communications Research and Translation; (5) Instrumentation Research; (6) Additional Opportunities for Stable Academic Careers; and (7) International Medical Research (table 26, p. 102).

Under other Public Health Service appropriations the following are recommended: (1) Intramural planning and construction for the National Institutes of Health, $4.4 million; (2) Health Research Facilities Construction, $50 million, and (3) Health Educational Facilities Construction, $60 million, as shown on page 103.

The distribution of the recommended funds according to institutes is presented in table 27, pages 104–106.

Recommendation:

A total budget for the National Institutes of Health for fiscal year 1961 of approximately $664 million should be considered a reasonable estimate of the funds which could be wisely and usefully expended through the National Institutes of Health for the attack on major disease problems during the coming year, provided adequate time is allowed for planning and staffing new programs. This represents an increase of $264 million over the budget for fiscal year 1960.

To this should be added under separate appropriations $4.4 million for intramural planning and construction, $50 million for health research facilities construction, and $60 million to initiate a program of health educational facilities construction.

Appendix I

HISTORY OF THE COMMITTEE OF CONSULTANTS ON MEDICAL RESEARCH

When the Committee on Appropriations of the U.S. Senate considered the appropriations bill submitted by the Subcommittee on the Departments of Labor, and Health, Education, and Welfare for fiscal year 1960, the members expressed concern regarding the size of the increase proposed for the National Institutes of Health over the appropriation of $294,383,000 for the previous year. The sum proposed by the subcommittee was $480,604,000, an increase of $186,325,000 over the President's budget and an increase of $136,325,000 over the House allowance. In the subsequent conference with the House, the appropriation was set at $400 million, an increase of approximately $106 million, or 36 percent, over the previous year.

The Senate Appropriations Committee approved the increase as proposed by the subcommittee on June 23, 1959, and in doing so proposed the following resolution which was passed by unanimous vote:

> *Resolved*, That the subcommittee with funds available to the committee for investigations organize a group of specialists and others to determine whether the funds provided by the Government for research in dread diseases are sufficient and efficiently spent in the best interests of the research for which they are designated, said subcommittee shall take into account the facilities, the experts, the laboratories, the availability of private funds and all other factors including the possible impact which the recruitment of those engaged in research enter into such a study of research efforts. The Subcommittee on Appropriations for the Departments of Labor, and Health, Education, and Welfare shall make its report to the Committee on Appropriations on or before February 1, 1960.

Plans were initiated in August by the Senate Appropriations Subcommittee for the Departments of Labor, and Health, Education, and Welfare, under Senator Lister Hill as chairman, leading to the formation of the Committee of Consultants on Medical Research.

On August 14th the mission of this committee was given added emphasis when the President, in signing the appropriation bill for the Departments of Labor, and Health, Education, and Welfare, issued a statement which embodied some of the same concerns which had been expressed by the Senate committee, and ordered the adoption of certain criteria which would tend to satisfy these concerns.

The President's statement of August 14, 1959 follows:

THE WHITE HOUSE

STATEMENT BY THE PRESIDENT

I have today approved H.R. 6769, which makes appropriations for fiscal 1960 for the Departments of Labor, and Health, Education, and Welfare, and for certain other agencies.

I have taken this action despite concern with regard to the appropriations for the Department of Health, Education, and Welfare.

First, with respect to medical research, every American is of course deeply interested in the improvement of health. This interest is reflected in the administration's progressive record of support for health activities. But there is a limit to the rate at which medical research can grow and yet grow soundly. Appropriations to the National Institutes of Health have increased fourfold in the last 6 years. H.R. 6769 would add a further increase—from $294 million to $400 million—or 36 percent in a single year. This increase gives me cause for concern on three grounds. I am concerned lest it should:

(1) Lower the quality of the projects supported by increasing the flow of grant applications more rapidly than the procedures for their careful appraisal can be effectively adapted;

(2) Cause too great a diversion into research of the manpower and other resources needed for equally vital teaching and medical practice;

(3) Substitute Federal funds for non-Federal support of medical research and training and discourage further expansion of such support.

Such effects would work against the very goal being sought—improved health for all the American people. Indeed, the Congress itself apparently felt concerned about the possible lowering of research quality which might result from the level of funds it approved, since the conference report on H.R. 6769 states that "there should be no reduction in the high standards for determining the acceptability of research projects for financing from these appropriations."

Because the American taxpayer is entitled to have his tax money spent wisely and efficiently, I am directing the Secretary of Health, Education, and Welfare and the Surgeon General of the Public Health Service to take appropriate steps to satisfy themselves that the following criteria will be observed in the review of any new research project or training program:

(1) That it is of such high priority and great promise that its deferment would be likely to delay progress in medical discovery;

(2) That it will not result in the harmful diversion of manpower and other resources needed for teaching and medical care services; and

(3) That it will not bring about the substitution of Federal for non-Federal sources of support for medical research and training.

Second, in the category of construction grant programs—grants for the construction of sewage treatment plants, facilities for medical care and research, and schools in federally affected areas—the appropriations made in the bill would provide for program levels which seem to me to be entirely too high in relation to other essential Government programs.

I do not doubt that worthwhile construction projects can be found in each of these areas which will absorb the funds appropriated. But the mere fact that money is spent for some identifiable need does not mean that it is wisely spent, or that it must be spent by the Federal Government. With respect to the waste treatment construction grant program, I am requesting the Secretary of Health, Education, and Welfare to urge the States, in their various State plans, to make every effort to give first priority in the approval of projects by the States to those which involve interstate stream pollution or affect downstream communities.

A national budget demands hard choices just as does a family budget. The recognition of a need is the beginning, not the end of any budget-making process. I recognize, however, that in reconciling competing demands within the total framework of a sound fiscal policy, the Congress, as well as the executive branch, has responsibility for the exercise of judgment. Therefore, even though I disagree in this instance with the manner in which that judgment has been exercised, I do not feel that I should withhold my approval of this bill.

A nucleus of the Committee began meeting in September, but the membership was not completed until November. Formal announcement of the establishment of the Committee was made by Senator Hill on October 6, 1959 with the membership as follows:

BOISFEUILLET JONES, *Chairman*
Vice President and Administrator of Health Services, Emory University, Atlanta, Ga.

ALFRED BLALOCK, M.D.
Professor and Chairman, Department of Surgery, Johns Hopkins University Medical School, Baltimore, Md.

VIRGINIA G. S. BURNHAM
Vice President, Connecticut Manufacturing Co., Inc., Waterbury; Greenwich, Conn.

MICHAEL E. DE BAKEY, M.D.
Professor and Chairman, Department of Surgery, Baylor University College of Medicine, Houston, Tex.

EDWARD DEMPSEY, Ph. D.
Dean, Washington University School of Medicine, St. Louis, Mo.

SIDNEY FARBER, M.D.
Professor of Pathology, Harvard Medical School; Director of Research, Children's Cancer Research Foundation, Boston, Mass.

HARRY LYONS, D.D.S.
Dean, School of Dentistry, Medical College of Virginia, Richmond, Va.

LEO RIGLER, M.D.
Visiting Professor of Radiology, University of California Medical School at Los Angeles; Executive Director, Cedars of Lebanon Hospital, Los Angeles, Calif.

DAVID SARNOFF, Brig. Gen. (USAR)
Chairman of the Board, Radio Corp. of America, New York, N.Y.

CORNELIUS H. TRAEGER, M.D.
Professor of Clinical Medicine, Cornell University Medical School, New York, N.Y.

J. WALTER WILSON, Ph. D.
Professor and Chairman, Department of Biology, Brown University, Providence, R.I.

CECIL WITTSON, M.D.
Professor and Chairman, Department of Neurology and Psychiatry, University of Nebraska School of Medicine, Omaha, Nebr.

Dr. Margaret H. Sloan was granted leave of absence from the National Academy of Sciences-National Research Council to serve as staff director for the study. Mrs. Cecil M. Wootton was also granted leave from the National Academy of Sciences-National Research Council to serve as executive secretary, and Mrs. Bernice H. Storrer was loaned by the National Institutes of Health to fill the role of staff assistant.

The Committee was not selected to represent any particular groups, agencies or organizations. Of the twelve Committee members, nine are medical scientists and three are informed laymen, and the staff director is a physician with nongovernmental medical administrative experience. All of the members have served at one time or another as consultants and advisers in various aspects of the Government's research program and have shared the responsibility of seeing that the funds for research and training supplied by the Federal Government were utilized to maximum effectiveness. Each has a full-time occupation independent of the Government.

Most of the members have had service on study sections or advisory councils of the National Institutes of Health and therefore could bring to bear on the deliberations of the Committee a considerable knowledge of National Institutes of Health policies, operating procedures, and research program. Collectively, they were able to evaluate the total Federal program in support of medical research from personal experience in three different relationships: (1) as research investigators applying to the Federal Government for support; (2) as members of committees, study sections, or councils advising on matters of policy and evaluating the applications of others; (3) as members of the administration or the academic faculties of medical schools or universities responsible for teaching, the fostering of research in their departments and, in the case of members of clinical services, also responsible for patient care. One

member who had not had previous association with the National Institutes of Health contributed a thorough understanding of the problems of research and of research investigators in the electronics field, which seems destined to make enormous contributions to the instrumentation for medical research in the future. He was, therefore, able to take a fresh and very objective view of the Federal program of medical research against the background of his own experience in Government and industry.

The Committee met on alternate weekends from October 1959 until February 1960 and devoted March and April to the preparation of a report. It proved impossible to complete the hearing of witnesses before the end of January and, in consideration of the magnitude of the task assigned, the date for submission of the report was extended to May 1960.

The members examined a wealth of information available from many sources and specific data gathered at the Committee's request. Of particular interest and value were the reports of two other consultant groups which have recently made related studies:

U.S. Department of Health, Education, and Welfare, Office of the Secretary. *The Advancement of Medical Research and Education Through the Department of Health, Education, and Welfare: Final Report of the Secretary's Consultants on Medical Research and Education, 1958* (The Bayne-Jones Report).

U.S. Department of Health, Education, and Welfare, Public Health Service. *Physicians for a Growing America: Report of the Surgeon General's Consultant Group on Medical Education, 1959* (The Bane Report).

A partial list of the documents reviewed in the course of this survey can be found in the bibliography.

Over 100 experts in various fields of medicine, public health, education, and related activities presented testimony before the Committee during the course of these meetings. The Committee would like to express its sincere appreciation for the willingness of these witnesses to devote time and thought to this endeavor and for the valuable and pertinent information they presented. This report does not reflect the views of individual witnesses, but their collective testimony was extremely helpful to the Committee in its deliberations.

On the basis of the testimony of this outstanding group of witnesses, a study of the reports of earlier survey committees and of the massive body of pertinent data available, a review of the programs of the National Institutes of Health and of other Federal agencies supporting medical research, and long discussion both within and outside the scheduled meetings of the group, the members of the Committee of Consultants on Medical Research reached conclusions and made recommendations by unanimous agreement.

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(Whereupon, at 1:05 p.m., Friday, May 20, 1960, the subcommittee adjourned.)

DEPARTMENT OF LABOR

LIST OF WITNESSES

	Page
Ambursen, Frances A	95
Anderson, Warren C	108
Arnow, Philip	15
Babe, John J	111
Bartlett, Hon. E. L	1027, 1029
Bradley, Hugh W	67
Christensen, W. C	60
Clague, Ewan	15
Costello, Francis J	108
Curtis, W. R	24
Dodson, James E	1, 15, 24, 60, 67, 76, 88, 95, 101, 108, 111, 118
Evans, Richard D	101
Fitzgerald, Henry J	15
French, Ralph E	60
Ganz, Samuel	108
Gidel, Robert D	76
Goshen, Edward E	60
Gundersen, Howard B	60
Harding, Curtis P	1071
Holcombe, John L	88
Jenkins, Howard	88
Johnson, Frank E	24
Jones, Richard F	15
Kerschbaum, Paul R	15
Ketchin, Ella C	76
Kuehl, Frank W	76
Leopold, Alice K	95
Levine, Louis	24
Lodge, George C	118
Love, Eugene	24
Lundquist, Clarence T	108
Maas, Maj. Gen. Melvin J	71
Manor, Stella P	95
McCahill, William P	71
McCauley, William	101
McConnell, Beatrice	76
McGee, Hon. Gale W	1033
Miller, Forest L	24
Minor, Leroy T	101
Mitchell, Hon. James P	1
Moore, Albert L., Jr	88
Morrison, Alice A	95
Motley, A. W	76
Myers, Robert J	15
Norwood, William U	24
Nystrom, Harold C	111
O'Connor, Daniel L	88
Omohundro, Edward L	24
Schwartz, Theodore M	101
Shaffer, Willard H	111
Tinsley, Thomas A	101
Triggs, Matt	1253
Van Zant, Robert P	76
Weiss, Morris	88

DEPARTMENT OF LABOR

INDEX

	Page
General statement of Secretary Mitchell	1–14
Agricultural labor	5
Appropriation estimate	1–5
Chronic labor surplus	6
International labor affairs	4
Management improvement	5
Mexican farm labor	4, 11
Migratory farmworkers	13–14
Older workers	6
Recruitment of new employees	3
Seasonal agricultural employment	12–13
State employees, salary increases	2
Table:	
Analysis of 1961 budget estimate	8
Appropriations, 1951–60	9–10
Workload acceleration	2
Bureau of Apprenticeship and Training:	
Appropriation estimate	60–61
Community level promotion	65–66
Construction industry	65
Local industry promotion	66
National industry promotion	64
Statement of Bureau Director	62–63
Technical knowledge of worker	66–67
Outside witnesses, statements of	1268–1269
Bureau of Employees' Compensation:	
Employees' compensation fund:	
Appropriation change	106–107
Appropriation estimate	103–104
Statement of Bureau Director	105–106
Status of fund	107
Salaries and expenses:	
Adequacy of funds	107
Appropriation estimate	101–103
Federal employees' compensation program	105
Longshoremen's and harbor workers compensation program	105
Statement of Bureau Director	104–106
Bureau of Employment Security:	
General statement of Deputy Director	24–30
Annual worker plan	31–32
Automation and technical change	31–32
Farm labor market	31
Labor force, total	30
Mexican farm labor program	4, 11, 32–33
Older workers	6, 31, 35
State unemployment insurance funds	33–34
Grants to States:	
Appropriation estimate	36–37
Level of unemployment	44–45
Statement of Deputy Director	43–44
Tables, State unemployment compensation funds	38–42
Unemployment compensation, extension of coverage	45

Page
Outside witness, statements of 1034–1037, 1071–1078, 1262
Salaries and expenses:
Appropriation estimate 45–46
New positions requested 49
Statement of Deputy Director 46–49
Outside witnesses, statements of 1267–1268
Unemployment compensation for Federal employees and ex-servicemen:
Appropriation estimate 49–50
Benefit payments 52
Statement of Deputy Director 51
Statement of Director of Veterans' Employment Service 52–53
Veterans' Employment Service 52–54
Compliance activities, Mexican farm program:
Appropriation estimate 55
Mexican laborers, number 57–58
New positions 57
Statement of Deputy Director 56–57
Outside witnesses, statement of 1253–1261
Salaries and expenses, Mexican farm program:
Appropriation estimate 58
Statement of Deputy Director 59–60
Bureau of Labor-Management Reports:
Appropriation estimate 88–89
Complaints 91
Effects of law 94
Employment 91
Field organization 93
Initial operations 90–91
Positions requested 94
Statement of Commissioner 89–94
Technical assistance 92–93
Bureau of Labor Standards:
Appropriation estimate 76–79
Industrial accidents 79–80, 86
Migratory labor, improving conditions of 83–84, 87
State labor legislation 82–83, 86
Statement of Bureau Director 79–85
Welfare and pension plan data 81–82, 86
Young workers 84–85, 87
Outside witnesses, statements of 1265
Bureau of Labor Statistics:
Revision of Consumer Price Index:
Appropriation estimate 21
Cincinnati survey 23
Statement of Commissioner 22–23
Salaries and expenses:
Appropriation estimate 15
Labor aspects of world trade 19–20
Older workers 6, 20–21
Statement of Commissioner 17–19
Outside witnesses, statements of 1027, 1029, 1037–1040, 1066, 1266–1267
Bureau of Veterans' Reemployment Rights:
Appropriation estimate 67–68
Legislation pending 69
Statement of Bureau Director 68–69
Workload statistics 70
Office of the Secretary:
Accounting and payroll, centralization of 121–123
Appropriation estimate 118–120
International labor program:
Communist activity 125
Foreign trade unions 127
Positions requested 125–126
Statement of Assistant Secretary 123–124
Outside witnesses, statements of 1269

Office of the Secretary—Continued Page
Statement of Administrative Assistance Secretary 120
Working capital fund, change in language 122
Office of the Solicitor:
Appropriation estimate 111–112
Labor-Management Reporting and Disclosure Act:
Function of Solicitor's Office 115–116
Material prepared 117
Prosecutions 116–117
Staffing 117–118
Workload 117
Statement of Solicitor 113–115
President's Committee on Employment of the Physically Handicapped:
Appropriation estimate 71–72
Committee activities 72
Mentally and emotionally handicapped 74–76
Statement of Committee Chairman 72–74
Wage and Hour Division:
Appropriation estimate 108–109
Employee health benefits program 111
Enforcement program 109–110
Statement of Administrator 109–110
Territorial wage order program 110
Violation of law 110–111
Walsh-Healey public contracts program 110
Outside witnesses, statements of 1264
Women's Bureau:
Appropriation estimate 95–96
Day care 97
Equal pay 98, 100
Field activities 99–100
Legal status of women 98–99
Migratory labor 97
Minimum wage 98
Occupational information 97–98, 100
Older workers 6, 99
Statement of Bureau Director 96–100
Women in labor force 96–97, 101

54568 O—60—pt. 2——19

HEALTH, EDUCATION, AND WELFARE

LIST OF WITNESSES

Witness	Subject matter	Page
Adams, Appollonia O	Nursing resources	488
Adkins, Bertha S	White House Conference on Aging	709
Anderson, Hon. Clinton P	Control of veneral disease	1251
Anderson, Dr. Robert J	Communicable diseases	41
Andrews, Dr. Justin M	Allergy and infectious diseases	79
Arnold, Dr. Francis A	Dental research activities	903
Babbidge, Homer D	Defense educational activities	352
Banta, Parke M	Office of the General Counsel	728
Bartlett, Hon. E. L	Indian health facilities, Arctic Health Research Center.	1024
Baughman, George F	Indirect costs of research	1101
Blalock, Dr. Alfred	Medical research, medical manpower.	1340
Bloedorn, Walter A	Gorgas Memorial Laboratory	1030
Blomquist, Dr. Edward T	Tuberculosis	412
Boggs, Mrs. Fitzhugh W	Department of Health, Education, and Welfare, general.	1120
Burbridge, Dr. Charles E	Freedmen's Hospital	219
Burney, Dr. Leroy E	Public Health Service, general	373, 515
Burnham, Mrs. Virginia G. S.	Effect on non-Federal sources of support.	1354
Cardwell, James B	Food and Drug Administration	210
Chavez, Hon. Dennis	Indian health	1147, 1187
Christgau, Victor	Old-age and survivors insurance	571
Clark, Hon. Joseph S	Department of Health, Education, and Welfare, general.	993, 1174
Cooper, Hon. John Sherman.	Vocational rehabilitation	1173
Daft, Floyd S	Arthritis and metabolic diseases	920
Danstedt, Rudolph T	Social Security Administration	1197
DeBakey, Dr. Michael E	Other Government agencies' research.	1357
Dempsey, Dr. Edward	Division of General Medical Sciences.	1406
Derthick, Dr. L. G	Office of Education	316
Doran, Harry L	Public Health Service	535, 537
Dunn, Mrs. Payton Hawes	Animal quarters, FDA	1086
Egan, Hon. William A	Arctic Health Research Center	1007
Elstad, Dr. Leonard M	Gallaudet College	667
Endicott, Dr. Kenneth M	Health research facilities construction grants.	940
Farber, Dr. Sidney	Cancer, and allergy and infectious diseases.	1382, 1417
Felix, Dr. R. H	Mental health activities	864
Ferebee, E. E	Office of Vocational Rehabilitation	229
Flemming, Arthur S	Department of Health, Education, and Welfare, general.	263
Fong, Hon. Hiram L	Amendments concerning Hawaii	1280
Free, Mrs. Ann Cottrel	Animal quarters, FDA	1078

LIST OF WITNESSES—Continued

Witness	Subject matter	Page
Freeman, Hon. Orville L	Indian health	1145
Goodwin, Kathryn D	Public assistance grants	582
Gruening, Hon. Ernest	Department of Health, Education, and Welfare, general.	998
Haldeman, Dr. Jack C	Grants for hospital construction	459
Hambleton, John W	Office of the Secretary	733
Harper, Paul	Maternal and child health	1184
Hart, Hon. Philip A	Water pollution control	1024
Harvey, John L	Food and Drug Administration	208, 216
Heller, Dr. J. R	National Cancer Institute	840
Hennings, Hon. Thomas C	Grants for hospital construction	996
Hollis, Mark D	Waste treatment facilities	455
	Environmental health	448
Humphrey, Hon. Hubert H	Department of Health, Education, and Welfare, general.	996, 1145, 1172, 1307
Hunt, Dr. G. Halsey	General research and services, NIH.	770
Hunt, Joseph	Office of Vocational Rehabilitation	254
Jessup, Dr. R. Bruce	Health of migratory workers	1136
Johnson, Hon. Lyndon B	Arkansas-Red River survey	1194
Johnson, Dr. Mordecai W	Howard University	682
Jones, Boisfeuillet	Medical research	1323–1458
Jones, Mrs. Helen E	Animal quarters, FDA	1087
Jones, Dr. R. Frank	Freedmen's Hospital	226
Jordan, Hon. B. Everett	Tuberculosis, control of	1060
Kelly, James F	Department of Health, Education, and Welfare, general.	256, 260, 280, 302, 313, 486, 488, 546, 563, 664, 699, 733, 735, 790, 982
Ketcham, Frank S	Mental health (alcoholism)	1130
Krettek, Germaine	Library services, grants for	1195
Kurlander, Dr. Arnold B	Public Health Service, general	525
Larrick, George P	Food and Drug Administration	189
Long, Hon. Oren E	Amendments concerning Hawaii	1280
Lund, Chester B	Office of Field Administration	716
Lyons, Dr. Harry	Dental research	1372
Martin, George I	Vocational education	1112
Masland, Dr. Richard	Neurological and blindness activities.	811
Meyers, Fred	Animal quarters, FDA	1089
Miles, Rufus E., Jr	Department of Health, Education, and Welfare, general.	307
Mintener, Hon. Bradshaw	do	1066
Mitchell, William L	Social Security Administration	567, 588, 631, 654.
Mobley, M. D	Vocational education	1112
Morgan, Dr. Russell	Radiological health	1155
Murray, Hon. James E	Department of Health, Education, and Welfare, general.	1277
Nelson, Dr. Kenneth R	Hospitals and medical care	479
O'Brien, Hon. Thomas J	Water pollution, waste treatment works construction	1010
Oettinger, Katherine B	Children's Bureau	607
Overholser, Dr. Winfred	St. Elizabeths Hospital	549
Pearson, James H	Vocational education	353
Pelton, Dr. Walter J	Dental resources	909
Plunkert, William J	Mental health (alcoholism)	1130
Porterfield, Dr. John D	Salaries and expenses, Public Health Service.	541

LIST OF WITNESSES—Continued

Witness	Subject matter	Page
Price, Dr. David E	Environmental health	387, 433
Ravion, Dr. Isidor S	National Cancer Institute	1302
Rigler, Dr. Leo	Instrumentation research	1370
Rogers, Col. Frank B	National Library of Medicine	530
Ross, Ward	Food and Drug Administration	1108
Sarnoff, Brig. Gen. David	Role of medical research	1327
Seward, Pere F	Assistance for school construction	336
Shafer, Dr. James K	Assistance to States, general (Pub-Health Service).	400
Shannon, Dr. James A	National Institutes of Health, general.	395, 739, 784, 802, 910, 935, 976, 981
Shaw, Dr. James R	Indian health	508
Smadel, Dr. Joseph E	Scientific activities overseas	979
Stough, Mrs. Ada Barnett	Children's Bureau	1175
Taggart, S. Ross	Venereal disease control	1209
Traeger, Dr. Cornelius H	Arthritis and metabolic diseases	1424
Truelson, Andrew R. N	Bureau of Public Assistance	605
Wallace, David H	Environmental health	1187
Watt, Dr. James	National Heart Institute	882
Whitten, E. B	Vocational rehabilitation	1166
Wiley, Hon. Alexander	Water pollution	1281
Williams, Hon. Harrison A., Jr.	Defense Education Act, health and child care for migratory workers.	987
Williamson, Kenneth	Grants for hospital construction	997
Wilson, Dr. J. Walter	Neurological diseases and blindness—manpower for research.	1348, 1392
Wittson, Dr. Cecil	Impact of Federal program on medical practice.	1352
Wynkoop, Roy L	Social Security Administration	606, 663
Yates, Hon. Sidney R	Water pollution, waste treatment works construction.	1010
Yeager, Dr. Robert L	Tuberculosis, control of	1041

HEALTH, EDUCATION, AND WELFARE

INDEX

A

Page

Additives, food 196, 211, 212
Advisory Council on Child Welfare Services, report of 570, 613, 1199–1200
Advisory Council on Public Assistance, report of 569–570, 602, 1200–1201
Aged and aging:
  Coordination and direction of programs relating to 705
  Health and care of the 377, 409–410, 651, 785–787, 1274
  Number of 642
  Research on aging 820, 779–781, 784–785
  White House Conference 409, 705, 709–716, 719, 721
Air pollution 438–439, 444, 446–454, 385–388
Alcoholism 874, 880, 1130–1136
Allergy and infectious disease activities (*see* Public Health Service, National Institutes of Health) 791–811
American Printing House for the Blind 664–667
  Appropriation estimate 664
  Pending legislation, relating to 667
  Preliminary estimates and Bureau of the Budget allowances (table) 182
  Prepared statement of superintendent in support of budget request 666–667
  Registration of blind pupils and fund allotments by States (table) 665
Animal farm, National Institutes of Health 540–541, 746
Animal quarters, National Institutes of Health 382, 540, 746
Appeal from House allowances by Secretary 367–372
Arctic Health Research Center 426–427, 431, 998–1002, 1004–1009, 1025–1027, 1028–1029
Arden House Conference on Tuberculosis 416–417, 1043–1055
Arkansas-Red River water project 389, 440, 1194
Arteriosclerosis 887–888, 890–891, 896, 898
Arthritis and metabolic disease activities (*see* Public Health Service. National Institutes of Health) 920–939
Assistance to States, general (*see* Public Health Service) 400–412, 990–992, 1136–1144
Auditing grant-in-aid programs 719, 721
Auto exhaust reducing devices 449–450, 451–452, 385–388

B

Bane report, "Physicians for a Growing America" 374
Bayne-Jones report, National Institutes of Health 272, 374, 300
Blind, education of the (*see* American Printing House for the Blind) 664–667
Blindness:
  Glaucoma testing, Freedmen's Hospital 225
  National Institute of Neurological Disease and Blindness, activities of the 811–840
  Outside witnesses, letter and statements of 1299–1301
Boisfeuillet Jones committee 384, 743
Bugbee, George, committee on community health facility planning 381, 464–465

C

Cancer research and control activities (*see* Public Health Service, National Institutes of Health) 840–863

Page

Chemotherapy:
Cancer 851–852, 855
Contracts, legal aspects of 731, 734
Tuberculosis 414, 416, 418, 419
Children's Bureau (*see* Social Security Administration) 607–631, 990–992, 1120–1122, 1130, 1175–1186, 1199–1202, 1271
Colorado River Basin project 440, 450
Commissioned officers, Public Health Service:
Expansion of corps 390
Retired pay of 535–537
Communicable disease activities (*see* Public Health Service) 419–433, 998–1002, 1004–1009, 1025–1027, 1028–1029, 1209–1253
Communicable disease center 428, 431, 383
Congenital heart disease programs 625, 629
Consultants on medical research (Boisfeuillet Jones committee) 384, 743, 1323–1458
Cosmetics, regulation of 197, 214–215
Credit Unions, Federal, Bureau of (*see* Social Security Administration) 570–571
Crippled children, services for 626, 629
Cystic fibrosis 615, 929–930, 796, 802–804

D

Deaf, education of the (*see* Gallaudet College) 667–681
Deaf, rehabilitation program for the 241
Deafness, research on 821, 825–827, 837
Deaths from principal causes: United States, 1953–59 (table) 373
Defense educational activities (*see* Office of Education) 338–354, 987–990, 995, 1118–1119
Dental health and research activities (*see* Public Health Service, National Institutes of Health) 903–920, 1275–1276, 1291–1297
Diabetes 926–927, 932
District of Columbia:
Reimbursements to Freedmen's Hospital 223
Reimbursements to St. Elizabeths Hospital 556, 560, 561, 562, 563–566
Venereal disease, incidence of 227

E

Education, Office of 316–365
Agriculture and the mechanic arts, colleges, further endowment of 325
Allotments by States (table) 326
Appropriation estimate 325
Prepared statement of Commission of Education 327
Commissioner, Office of Education, statement by 317–318
Defense educational activities 338
Allotments, grants, loans, by States (tables) 314–344
Appropriation estimate 338
Area vocational education 343, 349, 353
Educational media research 349, 353
Fellowships, national defense 281, 247, 351
Foreign areas and languages, advanced training in 348, 351–353, 1118–1119
Guidance, counseling, and testing, grants for 343, 347–348, 351
Hawaii, language provisions pertaining to 1280–1281
Language provision, appropriation act 280, 350–351, 368
Legal workload, caused by 734, 735
Outside witnesses, letters and statements of 987–990, 995, 1118–1119, 1280–1281
Prepared statement of Commissioner of Education 344, 350
Science, mathematics, and foreign language instruction, grants for 341, 342, 346–347, 350, 1280–1281
Secretary of Health, Education, and Welfare, testimony of 264, 268–269, 280–282
Statistical services, grants for improvement of 344, 349, 353
Student loan program 281, 341, 345, 350

Education, Office of—Continued Page
Defense educational activities—Continued
Summary of changes 340
Supplemental appropriation request, 1960 345
Library services, grants for 327
Appropriation estimate 327
House action, effect of 329
Language provisions, relating to 329, 368
Outside witnesses, letters and statements of 1129, 1195–1199, 1272–1277
Prepared statement of Commissioner of Education 329
Secretary of Health, Education, and Welfare, testimony of 269, 289
State table 328
Summary of changes 330
Mentally retarded, expansion of teaching in education of the 354
Appropriation estimate 354
Outside witnesses, letters and statements of 1122
Prepared statement of Commissioner of Education 354–355
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 168–170
Salaries and expenses 355
Appropriation estimate 355
Cooperative research program (Public Law 531) 318, 319, 358–359, 1116–1118
Higher education 359, 363
House action, effect of 361, 363
International education 360, 363
Outside witnesses, letters and statements of 1116–1118
Prepared statement of Commissioner of Education 358–361
Program direction and services 361, 363
School assistance in federally affected areas, administration of 359
School systems, State and local 361, 363
Secretary of Health, Education, and Welfare, testimony of 282
Statistics and research 358, 362
Summary of changes 356–357
Vocational education 359, 362
School construction, assistance for (Public Law 815) 332
Appropriation estimate 332
Entitlements by States (table) 334
House action, effect of 336, 338
Housing and Home Finance Agency, statement by 336–338
Outside witnesses, letters and statements of 1002, 1129, 1277
Prepared statement of Commissioner of Education 335
Secretary of Health, Education, and Welfare, testimony of 269
Summary of changes 333
School districts, payment to (Public Law 874) 330
Appropriation estimate 330
Entitlements by State, fiscal year 1960–61 (table) 332
Entitlements, funding of 294–295, 298–299
House action, effect of 335
Legislative proposal for change in school aid formula 293–299
Outside witnesses, letters, and statements of 1002, 1120, 1277
Prepared statement of Commissioner of Education 335
Secretary of Health, Education, and Welfare, testimony of 266, 269, 293–299
Summary of changes 331
Salaries and expenses (special foreign currency program) 364
Appropriation estimate 364
Prepared statement by Commissioner of Education 365
Tables:
Defense educational activities, allotments, grants, loans, by State 341–344
Land-grant colleges, allotments by State 326
Library services, grants to States for 328
Preliminary estimates and Bureau of the Budget allowances 1961 168–170
School construction, assistance for, entitlements by States 334
School district, payments to, entitlements by State 332
Vocational education, allotments by State 322–323

Education, Office of—Continued Page
Vocational education, promotion and further development of 320
Allotments by State based on House allowance (table) 322–323
Appropriation estimate 320
House action, effect of 324
Outside witnesses, letters and statements of 1112–1116, 1271–1272, 1278–1279
Prepared statement by Commissioner of Education 324
Secretary of Health, Education, and Welfare, testimony of 269–299
Shift of emphasis to more advanced training 324
Employees' compensation cases, funding of 303, 368, 482, 486
Entertainment expenses, language concerning 546
Environmental health activities (*see* Public Health Service) 383, 384–385, 433–454, 1010–1024, 1155–1166, 1187–1194, 1274–1275
Environmental Health Center 383, 443
Exhaust reducing devices, automobile 449–450, 451–452

F

Federal Credit Unions, Bureau of 570–571
Field Administration, Office of (*see* Secretary, Office of the) 716–722
Fluorescent antibody technique 425–426, 429, 897
Fluoridation 906–907, 909, 917
Food and Drug Administration 189–219
Certification, inspection, and other services, salaries and expenses (indefinite special fund) 203–204
Differences between preliminary budget estimate and final Bureau of the Budget allowance (table) 186–188
Salaries and expenses 189
Additives, food 196, 211, 264
Agriculture, Department of, cooperation with 216, 217
Appropriation estimate 189
Citizens Advisory Committee 193
Cosmetics, regulation of 197, 214–215
District offices, renovation of 199
Pharmacological laboratory:
Dogs, need of facilities for 199–201, 204–211, 303–304, 1078–1095
Estimated cost of 205–207, 210–211, 1087–1079, 1088, 1093
Public Works Committees, jurisdiction of 208–209
Field organization, study of by McKinsey & Co 193, 201
Fish, action against poison 213–214
Foreign imports, examinations of 194–201, 216, 218
House action, effect of 197
Laboratory-barn, Beltsville, Md 198
Laboratory-office building, Washington 193, 199, 280
New positions requested 191–192
Outside witnesses, letters and statements of 1067–1069, 1078–1100, 1108–1111, 1124, 1272–1273
Pesticide residues 195, 211, 212
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 167
Prepared statement, Commissioner of Food and Drug Adminitration 192–198
Radiological activities 194–195, 202–203, 279
Secretary of Health, Education, and Welfare, testimony of 264, 267–268, 278–280, 303–304
Summary of changes 190
Supplemental appropriation 1960, denial of request for 198, 203, 279
Foreign areas and languages, advanced training in 348, 351–353, 1118–1119
Foreign currency programs:
Education, Office of 364–365
General 276, 288–289
Public Health Service 979–985
Social Security Administration 660–664
Vocational Rehabilitation, Office of 235, 242, 259–261
Foreign imports, examination of 194, 201, 216, 218
Foreign quarantine activities (*see* Public Health Service) 499–508

Page
Freedmen's Hospital 219–229
Appropriation estimate 219
Facilities, description of 222
General statement of superintendent 222–224
Glaucoma casefinding 225
House action, effect of 220, 225
Nuring services, study by Public Health Service of 223
Parenteral solutions, request to purchase 224
Patient load data 222
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 168
Research by 222
Secretary of Health, Education, and Welfare, testimony of 268, 285
Summary of changes 221
Training program 224
Venereal disease, incidence of 226–228

G

Gallaudet College 667–681
Construction 672
Appropriation estimate 672
Building needed 677
Fieldhouse, need for a 675–676
Prepared statement of president of college 674
Summary of changes 673
Outside witnesses, letters and statements of 1070–1071
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 182
Salaries and expenses 667
Appropriation estimate 667
Enrollment, geographical distribution of 678–681
Kendall School 670
Prepared statement of president of college 670–671
Research activities 670
Summary of changes 669
Teachers of the deaf, training of 681
General Counsel, Office of the (*see* Secretary, Office of the) 728–737
General Medical Sciences, activities of the Division of (*see* Public Health Service, National Institutes of Health, general research and services) 770–790, 1406
General provisions, appropriations act 369, 372
Geographic medicine 935–937
Germ-free animal research 913, 937–938
Gorgas Memorial Laboratory 799, 758–759, 804–811, 1030–1033
Great Lakes and Illinois Waterway, investigation of pollution in 1010–1024, 1281–1283

H

Hansen's disease:
Carville Hospital, accomplishments of 484, 496
Hawaii, payments to 487–488
Hawaii, allotments to 1280
Health research facilities, grants for construction of (*see* Public Health Service, National Institutes of Health) 290–291, 375, 940–979, 1069–1070, 1290, 1399
Hearing and speech disorders, research on 821–822
Heart disease, congenital, programs on 625, 629
Heart research and control activities (*see* Public Health Service, National Institutes of Health) 882–903
Hill-Burton program (*see* Public Health Service, Hospital construction, grants for) 380, 459–475, 992–998, 1125–1128, 1273, 1277–1278
Hospital construction, grants for (*see* Public Health Service) 380, 459–475, 992–998, 1125–1128, 1273, 1277–1278
Hospital construction services, salaries and expenses (*see* Public Health Service) 476–478

Page
Hospitals and medical care (*see* Public Health Service) 479–499, 1064–1066
Hospitals of the Public Health Service 479–488, 496–499
Howard University 682–698
Construction of buildings 685
Appropriation estimate 685
General statement of president of university 696–697
Summary of changes 686
Plans and specifications:
Appropriation estimate 684
General statement of president of university 695
Summary of changes 685
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 183
Salaries and expenses:
Appropriation estimate 682
Enrollment, student 690, 692–693
Faculty, need for additional 693
General statement of president of university 692–694
Historical and background statement 681–691
Summary of changes 683

I

Illegitimacy, report on 603, 567, 570, 587
Impacted areas, aid to schools in federally (*see* Education, Office of) 293–299, 330–338, 1002, 1129
Indian health activities (*see* Public Health Service) 508–520, 1003, 1151–1155, 1278
Indian health facilities, construction of (*see* Public Health Service) 520–529, 1003, 1025, 1028, 1145–1151, 1153, 1187, 1278
Indirect costs of research 369, 301–303, 741–742, 1101–1108, 1290
Institutional research grants, proposal for 375, 742, 1290–1291, 1305, 1365
Instrumentation research 1370
International activities:
Education, Office of 360, 363, 364–365
Public Health Service 392–399, 406–407, 745, 822–823, 852–853, 893, 979–985
Secretary, Office of the 703, 706
Social Security Administration 660–664
Vocational Rehabilitation, Office of 235, 242, 259–261
Isoniazid for treatment and prophylaxis, tuberculosis 414, 418, 419, 514–515, 1054–1055

J

Jones, Boisfeuillet, chairman, Committee of Consultants 384, 743
Juvenile delinquency 611, 613–614, 615, 874, 880, 881, 882, 1201–1202

L

Land-grant colleges and universities, funds for 325–327
Language provisions in appropriations act 368, 546, 735, 1280–1281
Legislative proposals of the President 276
Leprosy (*see* Hansen's disease) 484, 496, 487–488
Library services, grants for (*see* Education, Office of) 327–330, 1129, 1195–1199, 1272, 1277

M

Management fund, Bureau of State Services 391, 442–443
Manhattan Beach Hospital, closure of 271, 303, 486, 498, 499
Medical research, consultants, statements by 1323–1428
Communications research 1366
Construction of health research facilities, grants for 1399
Costs of research 1363
General Medical Sciences, Division of 1406
Government agencies, other than Department of Health, Education, and Welfare 1357
Impact of the Federal program 1338
Medical manpower 1340
Medical schools 1340

Medical research, consultants, statements by—Continued Page
Introduction 1324
National Institutes of Health, general 1359
Allergy and infectious diseases 1382
Arthritis and metabolic diseases 1424
Cancer 1417
Dental research 1372
Heart 1378, 1381
Mental health 1386
Neurological diseases and blindness 1392
New areas 1430
General and categorical clinical research centers 1431
International medical research 1450
Medical libraries 1446
Primate centers and other animal resources 1443
Stable academic careers 1447
Role of medical research 1327
Summation of recommendations 1335
Summation of report 1457
Medical Services, Bureau of (Public Health Service) 459–529
Menieres disease 833–834
Mental health activities (*see* Public Health Services, National Institutes of Health) 864–882
Mentally retarded, programs for 354–355, 612, 625, 628, 1122, 1123
Metabolic diseases (*see* Public Health Service, National Institutes of Health, arthritis and metabolic disease activities) 920–939
Mexican border coverage, Division of Foreign Quarantine 379, 506–507
Middle America Research Unit 798, 805–811
Mortality statistics 373, 611, 615, 857, 886
Multiple sclerosis 241, 246–247, 817–818

N

National Defense Education Act (*see* Education, Office of) 338–354, 987–990, 995, 1118–1119
National health survey 283–284, 390, 547–548, 1275
National Institutes of Health (*see* Public Health Service) 739–985, 1069–1070, 1101–1108, 1124–1125, 1130–1136, 1273–1274, 1289–1290, 1275–1276
National Library of Medicine (*see* Public Helath Service) 530–535
National Orthopedic and Rehabilitation Hospital 1283–1284
Neurology and blindness activities (*see* Public Health Service, National Institutes of Health) 811–840
Nutrition, studies on 914, 930, 938–939
Nursing Homes:
Construction, need for 473
Improved standards and services for 409, 411
Medical care in 601, 785–786
Regional meetings on 601
Nursing:
Freedmen's Hospital, study of nursing services 223
Practical nurse training 322, 324
Public Health Nursing, Division of 408
Resources, development, and coordination of 485, 488
Training grants, Public Health Service 489–490
Outside witnesses, letters and statements of 1064–1066

O

Old-Age and Survivors Insurance, Bureau of (*see* Social Security Administration) 571–581, 1206–1207, 1270

P

Parkinson's disease 819, 828, 837–838
Pesticide residues 195, 211, 212
Pharmacological-laboratory building, Food and Drug Administration 199–201, 204–211, 303–304, 1078–1095

Page
Poliomyelitis 424, 430, 626, 629
Preliminary estimates and Bureau of the Budget allowances, 1961 (tables by agency) 167–185
Primate research centers 375–376, 819–820, 901–903, 1289–1290
Public Assistance, Bureau of (*see* Social Security Administration) 582–606, 1197–1198, 1200–1201, 1203, 1205–1206, 1270–1271
Public Health Service 367–548, 739–985
Assistance to States, general 400
Appropriation estimate 400
General health grants 407, 410
International health activities 394, 399, 406–407
Migratory workers, health of 990–992, 1136–1144
Outside witnesses, letters and statements of 990–992, 1136–1144
Prepared statement of Chief, Division of General Health Services, in support of budget request 406–410
Schools of public health 292–293, 403–406
Sources of support (table) 404–405
Summary of changes 402
Traineeships program 407, 410
Transfer of funds between programs 402
Vital statistics activities 408, 410
Buildings and facilities 537
Animal quarters, National Institutes of Health 540, 746
Appropriation estimate 537
Communicable Disease Center 383, 428, 431, 539
Dental research building and equipment 745, 910–911
Environmental Health Center 383, 443, 539
Prepared statement of Chief Finance Officer, PHS, in support of budget request 539–541
Research facilities, Lexington, Ky 540, 746
Research facilities construction and site acquisition, National Institutes of Health animal farm 540–541, 746
Surgeon General, statement by 382–383
Commissioned Officer Corps, increase requested 390
Commissioned officers, retired pay of (*see* Retired pay of commissioned officers) 535–537
Communicable disease activities 419
Appropriation estimate 419–420
Arctic Health Research Center 426–427, 431, 998–1002, 1004–1009, 1025–1027, 1028–1029
Communicable Disease Center 428, 431
Diagnostic reagents 426
Encephalitis 424–425
Fluorescent antibody technique 425–426, 429
House action, effect of 421, 432
Outside witnesses, letters and statements of 998–1002, 1004–1009, 1025–1027, 1028–1029, 1209–1253
Pesticides and vector control 425
Poliomyelitis 424, 430
Prepared statement by Chief, Communicable Disease Center 422–428
Pulmonary mycoses 425
Rabies 425
Staphylococcal disease 197, 424, 430–431, 432, 612, 796–797, 800–801
Summary of changes 421
Vector control 425
Venereal disease, incidence and control of 226–228, 273, 427–428, 429, 431, 432, 433, 1209–1253
Environmental health activities 433
Activities included 434, 438, 443
Air pollution 385–388, 438–439, 444, 446–454
Appropriation estimate 433
Auto exhaust reducing devices 449–450, 451–452
Environmental Health Center 443
House action, effect of 437
National Institutes of Health program on environmental health 774

Public Health Service—Continued
Environmental health activities—Continued Page
Other environmental health programs 436, 442, 1159–1160, 1162–1166, 1187–1189, 1192–1194
Outside witnesses, letters and statements of 1010–1024, 1155–1166, 1187–1194, 1274–1275, 1279, 1281–1283
Prepared statement by Chief, Bureau of State Services 438–443
Radiological health 265, 389–390, 441–442, 445, 1155–1158
Secretary of Health, Education, and Welfare, testimony of 270, 283, 284
Summary of changes 435
Supplemental request for 1960 443
Surgeon General, statements on 384–390
Water Pollution Control Act, legal services required by 732, 734
Water supply and water pollution 388–389, 439–441, 444–445, 1010–1024, 1160–1162, 1191, 1194, 1279, 1281–1283
Foreign quarantine activities 499
Aliens, examination of 501, 505
Appropriation estimate 499
Inspections by, Division of 504
Mexican border, coverage of 379, 501, 506–507
Prepared statement of Chief, Division of Foreign Quarantine 503–508
Prevalence of quarantinable diseases 502–503, 505–506
Summary of changes 500
Hospital construction, grants for 459
Allocations to States, tentative fiscal year 1961 (table) 462
Appropriation estimate 459
Bed deficit, hospitals 463–464
Bugbee committee on health facility planning 381, 464–465
Construction by States if Federal assistance were unlimited, 1961–1962 (tables) 466–472
Hawaii, language provisions pertaining to 1280–1281
House action, effect of 461
Joint financing of facilities by States 473
Nursing homes:
Construction, need for 473
Improved standards and services for 409, 411
Medical care in 601, 785–786
Regional meetings on 601
Outside witnesses, letters and statements of 992–998, 1125–1128, 1273, 1277–1278
Prepared statement of Chief, Division of Hospital and Medical Facilities 474–475
Research activities 380, 464, 475
Secretary of Health, Education, and Welfare, testimony of 265, 273, 290
Summary of changes 461
Surgeon General, statement by 380
Hospital Construction Services, salaries and expenses 476
Appropriation estimate 476
General statement of Chief, Division of Hospital and Medical Facilities 477
House action, effect of 477
Summary of changes 476
Hospitals and medical care 479
Age of Public Health Service hospitals 487
Appropriation estimate 479
Bureau of Employees Compensation cases, funding of 303, 482, 486
Carville, National Leprosarium 484, 496
Coast Guard medical services 485
Hawaii, payments to 487–488
House action, effect of 482–483
Nurse traineeships 489–490, 1064–1065
Nursing resources 485, 488–489, 1064
Outside witnesses, letters and statements of 1064–1066
Prepared statement of Chief, Division of Hospitals 496–499
Research by Public Health Service hospitals 484, 488

Public Health Service—Continued
Hospitals and medical care—Continued Page
Secretary of Health, Education, and Welfare, testimony of 271, 303
Summary of changes 481–482
Surgeon General, statement by 379
Indian health activities 508
Appropriation estimate 508
Contract patient care 513, 519
House action, effect of 510
Outside witnesses, letters and statements of 1003, 1151–1155, 1278
Physical plant, improvement in 518–519
Prepared statement of Chief, Division of Indian Health 515–520
Problems of Indian health 511, 515–516
Program accomplishments 512, 517–519
Secretary of Health, Education, and Welfare, testimony of 271, 285
Summary of changes 509–510
Surgeon General, statement by 377–378
Tuberculosis, control of in Indians 512–513, 514–515
Indian health facilities, construction of 520
Adequacy of quarters under Public Law 85–241 523, 529
Appropriation estimate 520
Gallup, N. Mex., housing 524
Hospitals and clinics 522, 523, 527–529
House action, effect of 521–522, 524
Outside witnesses, letters and statements of 1003, 1025, 1028, 1145–1151, 1153, 1187, 1278
Personnel quarters and housing 522, 523, 524–526, 529
Prepared statement of Chief, Division of Indian Health 527–529
Sanitation facilities 523, 524, 526, 529, 1145–1157, 1153, 1187
Secretary of Health, Education, and Welfare, testimony of 271, 285
Sells, Ariz., hospital at 525
Summary of changes 521
Management of Fund, Bureau of State Services 391, 442–443
National Institutes of Health 739–985, 1359
Allergy and infectious disease activities 791, 1382
Allergy immunology 795
Antibiotics, excessive use of 801–802
Appropriation estimate 791
Cystic fibrosis 796, 802–804
Fungus diseases 797
Gorgas Memorial Laboratory 758–759, 799, 804–811, 1030–1033
House action, effect of 792–793
Middle America research unit 798, 805–811
Outside witnesses, statements of 1030–1033
Prepared statement of Director, National Institute of Allergy and Infectious Diseases 793–799
Rocky Mountain Laboratory 798
Staphylococcal infections 796–797, 800–801
Summary of changes 792
Upper respiratory diseases 794–795
Virus research 794–795
Arthritis and metabolic diseases activities 920, 1424
Appropriation estimate 920
Cystic fibrosis 929–930
Diabetes 926–927, 932
Gastroenterology 930
Geographic medicine 935–937
Germ-free animal research 937–938
Gout 925
House action, effect of 922–923
Hypersensitivity 924–925, 933
Metabolism, basic research 927
NIH 75–19 (new analgesic) 928, 933
Nutrition surveys, civilian 930, 938–939

Public Health Service—Continued
Allergy and infectious disease activities—Continued
Arthritis and metabolic diseases activities—Continued Page
Prepared statement of Director, National Institute of Arthritis and Metabolic Diseases 923–931
Rheumatic diseases 923–926, 933
Summary of changes 921–922
Cancer Institute, National 840, 1417
Acceleration of programs, continuance of 857–858
Age groups, cancer in relation to 856–857
Allocations of grant-in-aid funds for cancer control (table) 854
Appropriation estimate 840
Chemotherapy program 851–852, 855
Control program 850–851, 854
Crash program in cancer, possibility of 843–845
Death rates by age (table) 857
Diagnostic development contracts (table) 861
Diagnostic research and development grants (table) 862
Diagnostic research and development program 850, 859–862
House action, effect of 842–843
Incidence rates by age, color and sex (table) 856
International activities 852–853
"Ivy" treatment, clinical testing of 863
Outside witnesses, letters and statements of 1302–1309
Prepared statement of Director, National Cancer Institute 845–853
Summary of changes 842
Virus research 848–849, 855
Dental health activities 903, 1372
Appropriation estimate 903
Equipment, dental research building 910–911, 919
Experimental caries research 907, 914
Fluoridation 906–907, 909, 917
Germ-free research 913
House action, effect of 905
Nutritional program 914
Outside witnesses, letters and statements of 1275–1276, 1291–1297
Payment plans, pre- and post- 919, 909
Prepared statement of Director, National Institute of Dental Research 912–920
Program statistics 912
Public health, dental 909, 917
Resources and manpower 908, 918–919
Summary of changes 904–905
General (all Institutes):
Advancing starting date of training grants 742, 761–763
Bane report 374
Bayne-Jones report 272, 300, 374
Biologics Standards, activities of Division of 747–749
Boisfeuillet Jones committee 384, 743, 1323–1428
Budget increases, absorption and utilization of 755–756
Buildings and facilities 540–541, 745–746, 910–911
Clinical research centers, grants for 742, 760–761, 1294, 1305–1306
General Accounting Office report 743
Geographic distribution of clinical center patients (table) 764–765
House action, effect of 749–750
Indirect cost of research projects 301–303, 741, 742, 1101–1108, 1290
Institutional research grants, proposal for 375, 742, 1290–1291, 1305
Medical research consultants' report 1458
Nobel Prize winners who have received National Institutes of Health grants 754
Outside witnesses, letters and statements of 1101–1108 1124–1125, 1273–1274, 1290–1291, 1297–1299, 1305–1306
Patient admission policy, Clinical Center 763, 766, 767–769

Public Health Service—Continued
Allergy and infectious disease activities—Continued
General (all Institutes)—Continued
Page
Preliminary estimates and Bureau of the Budget allowances (table) 177
Prepared statement of Director of National Institutes of Health 739–750
Secretary of Health, Education, and Welfare, testimony of 272, 299–302
Significant medical advances aided by the National Institutes of Health, list of 754–755
Unobligated balances under apportionment plan 1960 299, 744, 755
General research and services 770
Aging, grants in 784–785
Appropriation estimate 770
Center for Aging Research, activities of the 779–781
Communication and dissemination of research findings 785, 787–788
Division of General Medical Sciences 1406
Environmental health activities 774
House action, effect of 772–773
Prepared statement of Chief, Division of General Medical Sciences 773–781
Reviewing quality of research projects 788–790
Six areas of research responsibility, Division of General Medical Sciences 774–782
Summary of changes 771–772
Training activities 776–779, 783
Health research facilities, grants for construction of 940
Appropriation estimate 940
Fourth annual report of the Surgeon General 943–975
Matching requirements 976
Outside witnesses, letters and statements of 1069–1070, 1290
Prepared statement of Associated Director, National Institutes of Health 978–979
Projected study of national research resources needs 976–977
Secretary of Health, Education, and Welfare, testimony of 290–291
Surgeon General, statement on 375
Summary of changes 940
Heart Institute, National 882, 1378, 1381
Allocations by State, heart disease control funds (table) 885
Aneurism of the aorta, surgical treatment of 898–899
Appropriation estimate 882
Arteriosclerosis 887–888, 890–891, 896, 898
Chromotography 898
Coagulation and thrombolysis 892–893
Congestine heart failure 889–890
Control program, heart disease 885, 894–895, 900–901
Drug research 893
Fluorescent antibody technique 897
House action, effect of 884–885
Hypertension 888–889, 891, 897
International activities 893–894
Mortality statistics, diseases of the cardiovascular system 886
Outside witnesses, letters and statements of 1289–1290
Prepared statement of Director, National Heart Institute 886–895
Primate centers 375–376, 893, 901–903, 1289–1290
Rheumatic fever and heart disease 891
Summary of changes 882–884
Mental health activities 864, 1386
Alcoholism program 874, 880, 1130–1136
Allocations by State, grant-in-aid funds for mental health (table) 867
Appropriation estimate 864
Biochemical processes and mental disorders, research on 872, 878

Public Health Service—Continued
Allergy and infectious disease activities—Continued
Mental health activities—Continued
Page
Biometrics staff 870
House action, effect of 886–887
Intramural activities, National Institute of Mental Health 870–871
Juvenile delinquency, study of 614, 874, 880, 881, 882
Outside witnesses, letters and statements of 1130–1136
Patient load, mental hospitals and outpatient clinics 876–878
Prepared statement of Director, National Institute of Mental Health 868–876
Psychiatrists, number of 879–880
Psychopharmacology 875, 881
Research grants 868
St. Elizabeths Hospital, research center in 870, 878
State and community mental health programs 867, 870 873–874, 878, 880
Summary of changes 865–866
Training grants 869
Neurology and blindness activities 811, 1392
Aging, research on 820
Appropriation estimate 811
Cerebrovascular diseases (stroke and related ailments) 817, 828
Childhood and adolescence, chronic neurological disorders of 815–816
Disability, major cause of 814
Epilepsy 816
Glaucoma 820, 839
Hearing and speech disorders of 821–822, 837
House action, effect of 813
International conference on vascular disease of the brain 829–833
International research 822–823
Meniere's disease 833–834
Multiple sclerosis 817, 818
Neurosurgery 817, 827
Otosclerosis 825–827, 834
Outside witnesses, letters and statements of 1299–1302
Parkinson's disease 819, 828, 837–838
Perinatal studies 828
Pheylketonuria, screening for 612, 815
Prepared statement of Director, National Institute of Neurological Diseases and Blindness 814–824
Primate colony, Puerto Rico 819–820
Summary of changes 812–813
Vision disorders, research on 820–821, 835–837, 838–839, 1299–1301
Scientific activities overseas (special foreign ccurrency program) 979
Administration of program 982
Appropriation estimate 979
Countries involved 980
Disease problems, types of 984–985
Kwashiorkor, nutritional disease 980–981
Prepared statement of Associate Director, National Institutes of Health 982–985
National Library of Medicine, operations 530
Appropriation estimate 530
Construction, new building 531, 535
Prepared statement of Director, National Library of Medicine 534–535
Program statistics 535
Publications 534
Summary of changes 531
Preliminary estimates and Bureau of the Budget allowances, 1961 (tables) 172–178
Retired pay of commissioned officers 535
Appropriation estimate 535
General statement of chief finance officer, Public Health Service 536
Summary of changes 536

Public Health Service—Continued Page
Salaries and expenses 541
Appropriation estimate 541
Entertainment expenses 546
House action, effect of 543, 545
Management and central services 544, 547–548
National health survey 283–284, 390, 547–548, 1275
Prepared statement of Deputy Surgeon General 547–548
Public Health Methods, Division of 544, 547
Secretary of Health, Education, and Welfare, testimony of 248–285
Skilled personnel, authority to employ 545
Summary of Changes 542
Sanitary engineering activities (*see* Environmental health activities) 433–454
Surgeon General, testimony of 373, 397
Tables:
Cancer control, fund allocation by States 854
Cancer death rates by age 857
Cancer diagnostic development contracts 861
Cancer diagnostic research and development grants 862
Cancer incidence rates by age, color, and sex 856
Deaths from principal causes: United States, 1953–59 373
Geographic distribution of patients, National Institute of Health Clinical Center 764–765
Gorgas Memorial Laboratory and Middle America Research Unit, comparative data 807
Health research facilities program through December 31, 1959, grants, demands, and completed projects under 955–975
Heart disease control, fund allocations by States 885
Hospital construction, 1961 fund allocation by States 462
Hospital construction by States possible with unlimited Federal aid 466–472
Hospitals, construction dates of 487
Mental health grant-in-aid funds, allocations by States 867
Mexican border coverage, Division of Foreign Quarantine 507
Preliminary estimates and Bureau of the Budget allowances, 1961 172–178
Schools of public health, sources of support 404–405
Waste treatment works, fund allocations by States 456
Tuberculosis, control of 412
Appropriation estimate 412
Arden House Conference 414, 415, 416–417, 1043–1055
Budget estimate, reduction in 418
Casefinding 417–418
Contagious nature of 418
Hospitalization for, average period of 418
House action, effect of 413
Isoniazid, use of 414, 418, 419
Outside witnesses, letters and statements of 1002, 1009, 1041–1064, 1285–1288
Prepared statement of Chief, Tuberculosis Program, P.H.S. 413–415
Secretary of Health, Education, and Welfare, testimony of 273
Summary of changes 413
Vaccination for tuberculosis 1286–1288
Venereal disease, control of (*see* Communicable disease activities) 273, 419–433, 1209–1253
Waste treatment works construction 455
Allocations of grant-in-aid funds by States (table) 456
Applications on hand 457
Appropriation estimate 455
General statement of Associate Chief, Bureau of State Services 456–457
House action, effect of 456
Outside witnesses, letters and statements of 1003, 1020–1024, 1189, 1190
Projects provided by budget estimates and House allowance 457
Secretary of Health, Education, and Welfare, testimony of 266, 273, 290
Summary of changes 455
Surgeon General, Statement by 388

Q

Quarantine activities, foreign (*see* Public Health Service, foreign quarantine activities) Page 499–508

R

Radioisotopes, diagnostic tool 395
Radiological activities, Food and Drug Administration 194–195, 202–203
Radiological health 265, 389, 441–442, 445, 1155–1158
Rehabilitation Center, Hot Springs, Ark 242, 247–250
Retired pay of commissioned officers, Public Health Service (see Public Health Service) 535–537
Retirement test under old-age and survivors' insurance 637–651
Rheumatic diseases 923–926, 933
Russian health and research exhibits 393

S

St. Elizabeths Hospital 549–566
Administration building, extension and modernization of:
Appropriation estimate 554
Statements by Superintendent on 559, 562
Summary of changes 555
Buildings and grounds, major repairs and preservation of:
Appropriation estimate 552
Statements by Superintendent on 558, 561
Summary of changes 553
Construction:
Treatment and cafeteria building:
Appropriation estimate 554
Statements by Superintendent on 558, 561
Summary of changes 554
District of Columbia, role in financing 556, 560, 561, 562, 563–566
National Institute of Mental Health, Research Center at St. Elizabeths Hospital 870, 878
Patient load 557, 561
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 179
Salaries and expenses:
Appropriation estimate 549
House action, effect of 558
New positions requested 552
Statements by Superintendent on 556, 560
Summary of changes 550–551
Prepared statement of Superintendent 556–559
Research program 285–286, 558
Secretary of Health, Education, and Welfare, testimony of 273, 285–286
Staffing 557
Tranquilizer drugs, use of 561–562
Sanitary engineering activities (*see* Public Health Service, Environmental health activities) 433–454
School construction, assistance for (*see* Education, Office of 332–338, 1002, 1129, 1277
School districts, payments to (*see* Education, Office of) 293–299, 330–332, 335, 1002, 1129, 1277
Schools of public health 292–293, 403–406
Science, mathematics and foreign-language instruction 341, 342, 346–347, 350
Secretary, Office of the 699–737
Field Administration, Office of 716
Salaries and expenses 716
Aging, regional representatives on 719, 720, 721
Appropriation estimate 716
Grant-in-aid audits 719, 721
House action, effect of 722
Prepared statement in support of budget request 720–722
Summary of changes 717–718

Secretary, Office of the—Continued Page
General Counsel, Office of the, salaries and expenses 728
Salaries and expenses 728
Appropriation estimate 728
Court cases 732
House action, effect of 730, 731, 735
Increased duties 731
Prepared statement of General Counsel 733–735
Summary of changes 729
Preliminary estimates and Bureau of the Budget allowances, 1961 (tables) 184–185
Salaries and expenses 699
Aging, activities relating to 705
Appropriation estimate 699
House action, effect of 702, 704, 707
International activities 703, 706
Language provisions, Appropriations Act 367–368, 546–547
New positions requested 702, 703, 705
Prepared statement of Secretary, Department of Health, Education, and Welfare 705–708
Summary of changes 700–701
Working capital fund 706
Secretary, statement of 275
Surplus property utilization 722
Appropriation estimate 722
Prepared statement of Director, Office of Field Administration 724–725
Summary of changes 723
Tables by State, amounts made available for distribution and real property disposed of 726–727
White House Conference on Aging 709
Advisory Committee, recommendations of 714–715
Appropriation estimate 709
House action, effect of 710, 712–713
Prepared statement of Under Secretary 711–713
Public Health Service, preparations of, for 409
Regional representatives 719, 721
Special assistant for aging 705, 712
Summary of changes 709–710
Working capital fund 735
Appropriation estimate 735
House action, effect of 736
New authority requested 735
Prepared statement, budget officer, Department of Health, Education, and Welfare 735–736
Secretary of Health, Education, and Welfare, testimony of the 263–316
Appeal from House allowances 367–372
Education, Office of:
Defense educational activities 264, 268–269, 280–282
Library services, grants for 269, 289
Salaries and expenses 282
School construction, assistance for 269
School districts, payments to 266, 269, 293–299
Vocational education 269, 299
Food and Drug Administration:
Animal quarters 303–304
Food additives program 264
General 267
Laboratory, office building, Washington 280
Radiological activities 279
Supplemental appropriations 1960, request for 279
Foreign currency programs 276, 288–289
Freedmen's Hospital 268, 285
Legislative proposals:
Indirect costs of research projects 301–302
General 276
Medical training facilities, grants for construction of 291–292
Schools in federally affected areas, formula for assistance to 293–299
Schools of public health 292–293

Secretary of Health, Education, and Welfare, testimony of the—Continued Page
Prepared statement in support of budget requests 263–277
Public Health Service:
Environmental health 270, 283, 284
General 270
Hospital construction, grants for 265, 273, 290
Hospital and medical care 271, 303
Indian health activities 271, 285
Indian health facilities, construction of 271, 285
National Institutes of Health:
Construction of health research facilities, grants for 290–291
General 272, 299–301
Indirect costs of research projects 301–303
Salaries and expenses, Office of the Surgeon General 284–285
Schools of public health 292–293
Tuberculosis, control of 273
Venereal disease, control of 273
Waste treatment works construction 266, 273, 290
St. Elizabeths Hospital:
General 273, 285
Research activities 285–286
Secretary, Office of the:
General 275
White House Conference on Aging 275
Social Security Administration:
Children's Bureau activities 274, 286
Cooperative research activities 275, 286–287
General 265
Old-age and survivors insurance 273, 305, 309
Public assistance 274–286, 287–288, 305–311
Vocational Rehabilitation, Office of:
General 264, 270, 311
Grants to States 282–283, 312–314
Research and training 283
Social Security Administration 567–664
Children's Bureau:
Grants to States for maternal and child welfare 622
Appropriation estimate 622
Artificial hands for children 1181–1182, 1283
Child welfare services 627, 630
Commissioner of Social Security, statement by 570
Congenital heart disease 625, 629
Crippled children's services 626, 629
Grant tables 624–625
House action, effect of 627, 631
Maternal and child health services 626, 628
Mentally retarded children 612, 625, 628
Migratory workers, child welfare services for 990–992
Outside witnesses, letters and statements of 990–992, 1121, 1130, 1175–1186, 1199, 1201, 1271, 1283
Prepared statement of Chief, Children's Bureau 628–631
Secretary of Health, Education, and Welfare, testimony of 274, 286
Summary of changes 623
Salaries and expenses 607
Advisory Council on Child Welfare Services 613, 1199–1200
Appropriation estimate 607
House action, effect of 609, 616, 617
Juvenile delinquency, program and statistics 613–614, 615 874, 880, 881
Mental retardation program 612
Outside witnesses, letters and statements of 1121–1122, 1175–1177, 1199–1200, 1202
Prepared statement of Chief, Children's Bureau 610–616
Publications of 616
Research by 614–616, 1121–1122
Social services for children 613

Social Security Administration—Continued
Children's Bureau—Continued
Salaries and expenses—Continued Page
Summary of changes 608–609
Trends in population, etc 611
Within-grade promotions 617
White House Conference on children and Youth 618
Appropriation estimate 618
Prepared statement in support of budget request 620–622
Summary of changes 618–619
Commissioner, Office of the:
Salaries and expenses 654
Appropriation estimate 654
House action, effect of 657, 659
Outside witnesses, letters and statements of 1271
Prepared statement of Commissioner, Social Security Administration 658–660
Summary of changes 655–656
Commissioner, statement of 568–571
Cooperative research or demonstration projects in social security 631
Appropriation estimate 631
House action, effect of 635, 636
Old-age assistance, average monthly number of recipients (table) 654
Outside witnesses, letters and statements of 1202, 1204, 1207–1208, 1271
Prepared statement of Commissioner, Social Security Administration 634–635
Recipients of public assistance also receiving social security 636, 652
Retirement test under OASI 637–651
Review of public assistance caseload, annual requirement for 652–653
Secretary, testimony of 275, 286–287
Summary of changes 632
Cooperative research or demonstration projects in social security (special foreign currency program) 660
Appropriation estimate 660
General statement of Commissioner, Social Security Administration 661
House action, effect of 662
Summary of changes 660
Credit Unions, Federal, Bureau of 570–571
Old-Age and Survivors Insurance, Bureau of:
Salaries and expenses 571
Appropriation estimate 571
Appropriation language 578
Beneficiaries and benefit payments (tables) 580
Building, new, move to 575, 578
Commissioner of Social Security, statement of 568–569
Court cases 732
Electronic equipment, use of 574, 577
General counsel, division of OASI 734
House action, effect of 579
Neurological disorders, benefits paid to persons with 814
Organization and staffing 580
Outside witnesses, letters and statements of 1206–1207, 1270
Prepared statement of Director, Bureau of Old-Age and Survivors Insurance 575–581
Recipients of OASI on public assistance 305, 309, 636, 652
Referrals to the Office of Vocational Rehabilitation, study of 241, 245
Retirement test under OASI 637–651
Secretary of Health, Education, and Welfare, testimony of 273, 305, 309
Source of funds 581
Summary of changes 572–573
Workloads and workload estimates (tables) 581
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 180–181

Social Security Administration—Continued
Public Assistance, Bureau of: Page
Salaries and expenses 595
Administration, improvements in State and local 603
Advisory Council, report by 602, 1200–1201
Amendments of 1958, implementation of 599–600
Appropriation estimate 595
House action, effect of 597, 604
Medical care, improvement of 600–601
Joint planning with:
Public Health Service 601
Office of Vocational Rehabilitation 602–603
Children's Bureau 603
Outside witnesses, letters and statements of 1197, 1198, 1200–1201, 1203, 1270–1271
Prepared statement of Director, Bureau of Public Assistance 599–605
Secretary of Health, Education, and Welfare, testimony of 274, 286, 287–288, 305–311
Seminars, short-term training 597, 604, 605, 606
Summary of changes 596
Training, grants to States for 287–288, 605–606
Within-grade promotions, cost of 598
Public assistance:
Grants to States for:
Appropriation estimate 582
Caseload, requirement to review annually 652–653
Commissioner of Social Security, statement by 569
Expenditures by source of funds (tables) 590–594
Formula for determing grants 585
Harassment of recipients 307, 311, 651–652
Illegitimacy, report on 567, 570, 587, 603
Obligations by States for 1961, estimated (table) 584
Old-age assistance, costs of administration of 305, 308, 587, 588, 594
Outside witnesses, letters and statements of 1205–1206
Prepared statement of Director, Bureau of Public Assistance 585–587
Recipients also receiving OASI 305, 309, 636, 652
Recipients, trends in number of 569, 586
Secretary of Health, Education, and Welfare 274, 286, 287–288, 305–311
Summary of changes 583
Research or demonstration projects (*see* Cooperative research or demonstration projects) 631–654
Tables:
Beneficiaries and benefit payment, BOASI 580
Maternal and child welfare, grants to States for 624–625
Old-Age assistance, average monthly number of recipients, fiscal year 1959 654
Old-age assistance recipients who receive OASI benefits 309
Old-age assistance recipients, number of State and local employees, cost 1955–61 308
Preliminary estimates and Bureau of the Budget allowances, 1961 180–182
Public assistance, estimated obligations for grants to States, fiscal year 1961 584
Public assistance expenditures by source of funds 590–594
Workloads and workload estimates, BOASI 581
Staphyloccal infections 197, 424, 430–431, 432, 612, 796–797, 800–801
State Services, Bureau of (Public Health Service) 400–458
Student load program 341, 345, 350
Surplus property utilization 722–727

T

Tuberculosis, control of (*see* Public Health Service) 412–419, 1002, 1009, 1041–1064, 1285–1288
Tuberculosis, Indian health problem 512–513, 514–515, 517

V

Page
Vector control and pesticides 425
Venereal disease incidence and control of 226–228, 427–428, 429, 431, 433, 1209–1253
Vocational education (*see* Education, Office of) 320–325, 343, 349, 353, 1112–1116, 1271–1272, 1278–1279
Vocational Rehabilitation, Office of 229–262
Grants to States:
Allotment base and appropriations 250–251, 254–257, 315
Appropriation estimate 229
Extension and improvement, grants for 234, 250
Hawaii, language provisions relating to 1280–1281
Open-end appropriation, desirability of 253–254, 312
Original budget request 251
Secretary of Health, Education, and Welfare, testimony of 282–283, 312–314
Statements by Director on 250–254
Summary of changes 230
Tables by State 231–234
Unmatched funds, States with (including tables) 251–253, 283, 312
OASI disability referrals, study of 241, 245
Outside witnesses, letters and statements of 1123–1124, 1166–1174
Preliminary estimates and Bureau of the Budget allowances, 1961 (table) 171
Prepared statement of Director 240–243
Program administration, improvement of 240–241, 245
Program statistics (table) 244
Rehabilitation Center, Hot Springs, Ark 242, 247–250
Research and training 237
Appropriation estimate 237
House action, comments on 258
Original budget request 257–258
Prosthetics 257, 259
Secretary of Health, Education, and Welfare, testimony of 283
Speech and hearing 257, 258
Statements by Director, Office of Vocational Rehabilitation on 241, 244, 247, 257–258
Summary of changes 238
Table, Federal grants for research and training programs 239
Research and training (special foreign currency program) 235
Appropriation estimate 235
Reaction of foreign nations 260
Statements by Director, Office of Vocational Rehabilitation, on 242, 259–261
Summary of changes 235
Salaries and expenses 235
Appropriation estimate 235
New positions requested 237
Statement by Director on 261–262
Summary of changes 236
Secretary of Health, Education, and Welfare, testimony of 264, 282–283, 311–315
Selected disability areas, need for services in 241, 246–247

W

Waste treatment works construction (*see* Public Health Service) 388, 455–458, 1003, 1020–1024, 1189, 1190–1191
Water pollution, control of 388–389, 439–441, 444–445, 1010–1024, 1160–1162, 1279
White House Conference on Aging (*see* Secretary, Office of the) 409, 705, 709–716
White House Conference on Children and Youth 612, 618–622
Working capital fund 706, 735–737

RELATED AGENCIES

LIST OF WITNESSES

Witness	Subject matter	Page
Cassidy, Brig. Gen. John F.	U.S. Soldiers' Home	143
Eady, L. E.	Federal Mediation and Conciliation Service	160
Finnegan, Joseph F.	do	155
Freed, Stuart H. D.	U.S. Soldiers' Home	143
Gritton, Raymond A.	do	143
Habermeyer, Howard W.	Railroad Retirement Board	161
Haislip, Gen. Wade H.	U.S. Soldiers' Home	143
Isbell, Groysor H.	do	143
Leedom, Hon. Boyd	National Labor Relations Board	128
Mansfield, Hon. Mike	Federal Mediation and Conciliation Service	1040
Murray, Hon. James E.	do	1040
O'Neill, Francis A., Jr.	National Mediation Board	140
Romain, Col. Coleman	U.S. Soldiers' Home	143
Rothman, Stuart	National Labor Relations Board	128
Sussmann, Col. William A.	U.S. Soldiers' Home	143
Tracy, Thomas A.	National Mediation Board	140
Traub, Maj. Gen. David W.	U.S. Soldiers' Home	143
Wright, Clarence S.	National Labor Relations Board	128

RELATED AGENCIES

INDEX

	Page
Federal Mediation and Conciliation Service:	
Appropriation estimate	155
Caseload per mediator, proper annual	158
House action, effect of	159
Mediator workload (table)	157
Outside witnesses, statements of	1040
Statement of Director	156–158
Interstate Commission on the Potomac River Basin, statement of Executive Director	152–153
National Labor Relations Board:	
Appropriate estimate	128–130
Labor-Management Reporting and Disclosure Act	135
Litigation	136
Personnel	137
Recruitment and training	134
Space, need for additional	138
Statement of the Chairman of the Board	131–133
Statement of the General Counsel	135–137
Workload	135–136
Work progress	134
National Mediation Board:	
Appropriation estimate	140
Increase requested	142
Statement of Board member	141
Railroad Retirement Board:	
Actuarial balance	164
Appropriation estimate	161
Financial operations under the Railroad Retirement Act, fiscal years 1938–59 (table)	165
House allowance	163
Statement of Chairman of the Board	162–163
U.S. Soldiers' Home:	
Acreage of home	151
Appropriation estimate	143–145
Employee health benefits	150
Membership	149
Statement of Governor	145–149

○